

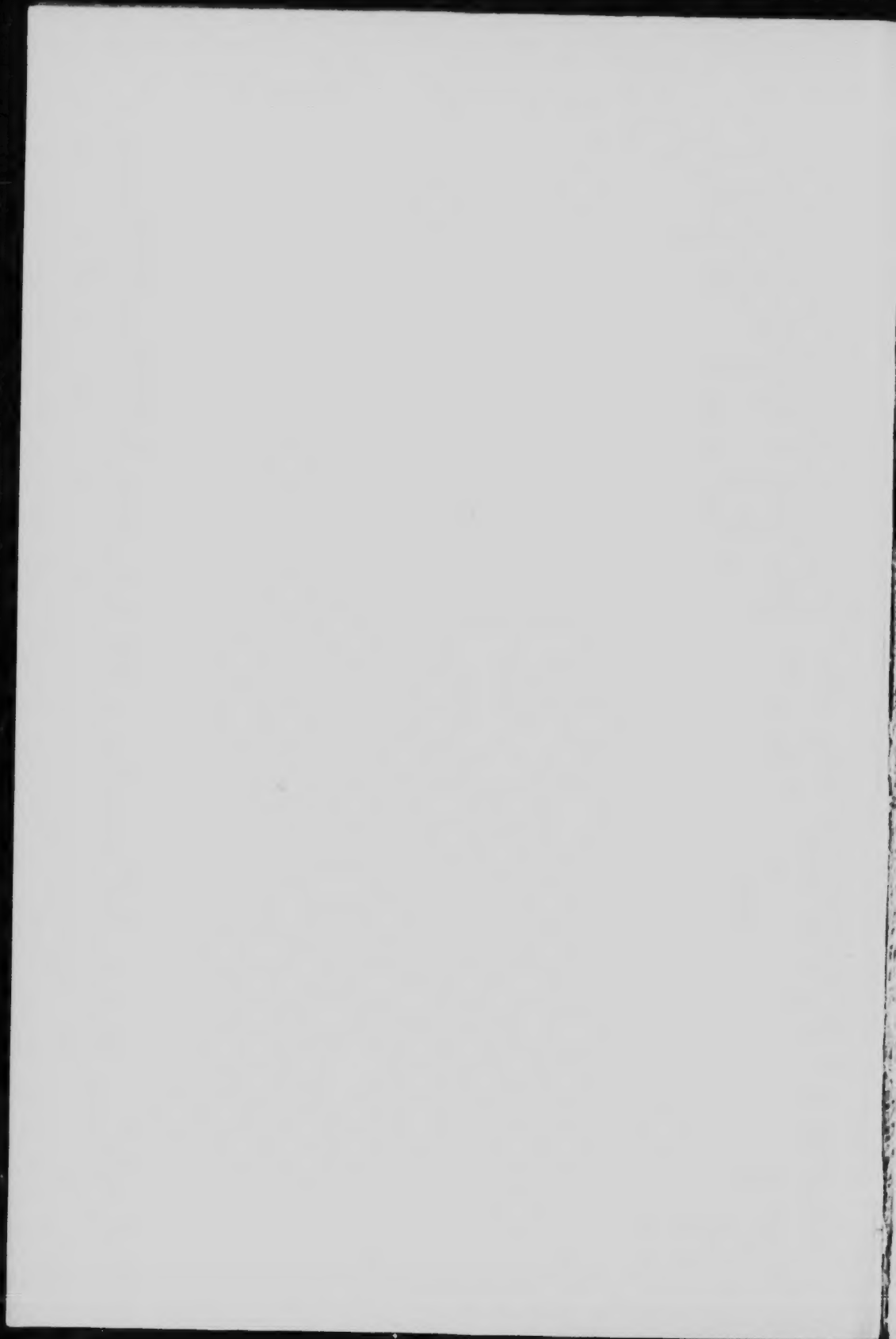
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Farm Dairying

Laura
Rose



*"Where are you going, my pretty maid?"
"I'm going a-milking, sir," she said.*



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~~Rose, Laura~~

FARM DAIRYING



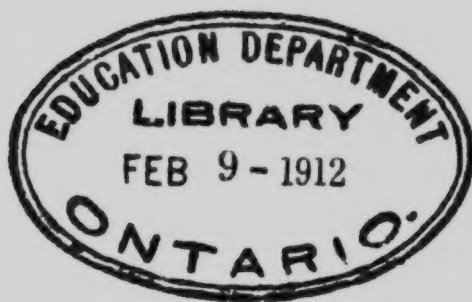




Photo y Savannah, Victoria B. C.

Very Sincerely Yours
Laura Rose

FARM DAIRYING

BY

LAURA ROSE

DEMONSTRATOR AND LECTURER IN DAIRYING AT THE ONTARIO
AGRICULTURAL COLLEGE, GUELPH, CANADA

WITH ILLUSTRATIONS



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A. C. McCLURG & CO.
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To Annie Rose
My Sister, Friend, and Co-Worker

NOTE

***I**N this book it has been my earnest desire and aim to present the dairy industry in a simple, practical manner, in the hope of benefiting those desirous of improving and succeeding in their chosen occupation. I have "been a-gathering this for years, a little at a time." It would be impossible for me to mention personally and to thank the many who have contributed to my store of knowledge. I am sincerely grateful to all. My happiest thought is that the knowledge I have acquired I hereby have the opportunity to give to others, that they in turn may be inspired to better work, receive more remuneration, and find a broader field of happiness in their labor.*

GUELPH, CANADA,
February, 1911.

L. R.

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FARM DAIRYING

CHAPTER I

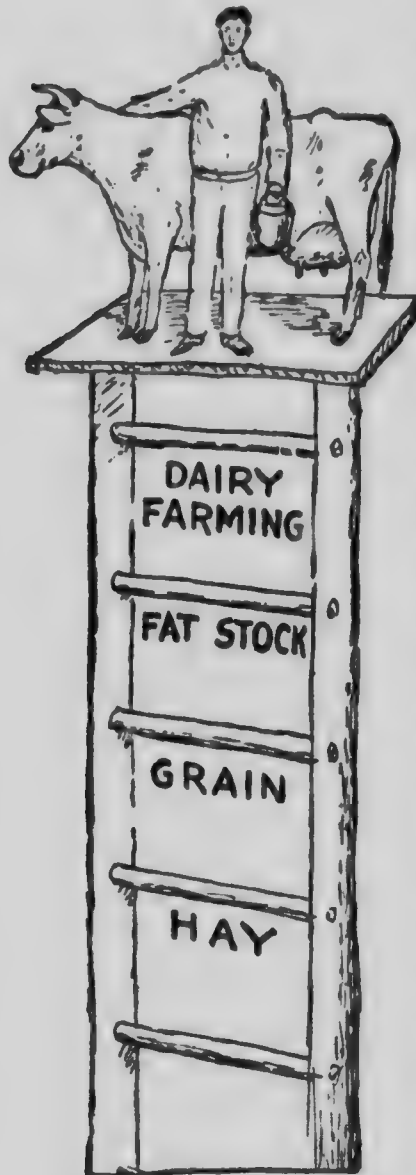
DAIRY AGRICULTURE

AMONG our agricultural pursuits dairying holds first place, from the standpoint of the necessity for a broad scientific agricultural education. It also ranks high as a remunerative industry when conducted on business principles and with the proper class of cows.

Of the different branches of agriculture, dairying is best calculated to keep up the fertility of the soil, to bring in the most continuous and least variable remuneration, to give steady employment the year round, and to stimulate and develop a deep intellectual and investigating interest in one's work.

To till the soil skilfully; to select carefully the best varieties of seed; to watch the growth of plants, of corn, oats, mangels, etc.; to harvest the same safely; to breed and rear the calves; to have these young animals develop into fine heifers, and later into splendid milking cows; to study their needs; to combine the home-grown fodder with the more concentrated bought feeds so as to ob-

FARM DAIRYING



AGRICULTURAL LADDER

tain the best results; to delve into the mystery of how the cow can take this food and manufacture the same into creamy white life-giving milk; scientifically to separate the cream and make the fat into golden bricks of fragrant butter; to get this butter to the best market and obtain for it the highest price; surely, to accomplish all this demands a man of no small calibre.

Is not then my contention true, that a man who successfully carries on a dairy farm is on the top rung of the ladder of agricultural achievement?

The man who is a

FARM DAIRYING

lover of good stock, and studies the needs of his animals, is ever the man who succeeds. There is no use entering the dairy business unless there is a natural liking for the cow, and a keen desire to help her to do her best. After all, much depends on the man.

CHAPTER II

THE DAIRY FARM

“The first farmer was the first man; and all historic nobility rests on possession and use of land.”

IN the selection of land for a dairy farm some essential points must be considered. If a choice of soil is to be had, a rich clay loam, easily drained, is the most preferable. Rough, cheap land is often used to advantage for pasture purposes, but more and more is intensive farming becoming popular — even to the extent of having a cow to each acre of land.

There must be a plentiful supply of good water all the year, and it should be convenient.

Another necessary consideration is a good market near at hand, or convenient transportation facilities. The importance of good roads is no small consideration.

To be a successful dairyman, a man must first be a successful farmer. He must understand soil conditions and the growing of crops. In other words he must have a good farm, well farmed, as well as a good herd, well cared for.

A well-kept lawn with shade trees and flowers gives much pleasure and comfort to those living

FARM DAIRYING

on the farm, and delights the eye of the passer-by. A nice lawn is a paying investment not only from the æsthetic side, but from the market-value side as well.

Every farm should have a suitable or distinguishing name, as "Meadowvale," "Poplar Lodge." "Fintona Farm," "Adanac Dairy." The name should be put up at the main entrance to the farm. A good way to advertise the farm's specialities is to mention them on the same placard, as for example:

GLENALPINE
Registered Ayrshires: Berkshire Pigs
C. L. HANNA.

Every crop grown on the farm has a value as a fertilizer, and when sold, permanently removes that amount of fertilizing matter from the farm. Very often an intelligent, industrious man makes a profitable investment by buying a run-down farm at a low figure, and stocking it with dairy cattle. By returning the manure in good condition to the land, he makes the exhausted soil become rich and raise good crops in a few years.

FARM DAIRYING

A study of the following table explains why poor run-out farms are built up by dairying. The figures show the amount of money received for the products sold, and the value of the fertilizing constituents removed from the farm, based on nitrogen being worth 12 cent per pound, phosphoric acid $4\frac{1}{2}$ cents, and potash $4\frac{1}{2}$ cents.

			Manurial value
1	ton mixed hay	\$ 12.00	\$5.80
1	" wheat @ \$1.00 per bu.	33.33	6.65
1	" live cattle @ 6c lb.	120.00	7.68
1	" whole milk @ \$1.25 per cwt.	25.00	1.60
1	" butter @ 30c lb.	600.00	.36

CHAPTER III

THE COW STABLE

I HEARD an old Scotchman, who proved it true, say many times, there were only two things for which a farmer should mortgage his farm, — first, to drain the land properly, so as to raise good crops, for prosperity cannot rise from wet, cold soil — the land must be drained; second. to build good barns in which to house the stock and crop. These two conditions, rightly managed, will erect a fine home and make a comfortable bank account.

I wish space permitted a lengthy discussion on the construction of the cow stable. It does seem to me that the health of the cows and the purity of the milk depend greatly on the stable. Four things are of prime importance, — sunlight, pure air, tight dry floors, and the comfort of the animals.

The first recorded utterance of God is, "Let there be light," and further it is stated, "God saw the light that it was good." The Creator of all things knew that light was good. We know it is good. Then why shut it out of our cow stables?

FARM DAIRYING

Did you ever see a stable without a window? I have seen many.

Fifteen minutes of direct sunshine brings death to most of the disease germs. When we have such a powerful disinfectant free, let us use it abundantly. Have plenty of windows in the stable. Let the sunlight get directly in on all sides if possible. Many have the windows hinged on the lower side and have them open inward from the top. This prevents a direct draught on the cows. Keep the windows free from cobwebs and wash them off occasionally.

It is easier to regulate the light than it is to ventilate properly. If we wish animals to remain healthy they must have pure air to breathe. This means that the foul air from the lungs, and odors from food and excretions, must escape and be replaced by fresh air. Thousands of animals are yearly becoming affected with tuberculosis, due to unsanitary conditions. Effective ventilation is of infinitely greater value than tuberculin. The first prevents the disease; the other only reveals its presence. There should be at least 500 cubic feet of air space for each cow.

In the stables of long ago no thought was taken of the air supply. It got in through the cracks and crevices. The better the stable is built,



BARN WITH NO PROVISION FOR ADMITTING LIGHT AND AIR: SUCH AS THESE ARE
BREEDING PLACES FOR TUBERCULOSIS

FARM DAIRYING

the more necessity for a good system of ventilation. Means of letting the air into the stable at or near the ceiling will usually prove best. The air taken in will, by reason of being cold, tend to fall to the floor and thus produce air movements which will keep the air within the stable stirred and uniform. The outlet flues or ventilators must extend to the top of the roof. Up to the present time the King system of ventilation, or a modification of it, is perhaps one of the best. Details of it may be had from any agricultural college.

When the air in a stable is good a person can go in and out from it and not have his clothes saturated with stable odor. Much of the "cowy-flavored" milk is directly due to milking in a badly ventilated stable. The air filled with offensive odors is carried into the milk pail, and the damage is done. Whether your stable is old or new, contrive some way of getting the foul air out and pure air in. Direct draught on the cows must be avoided. The muslin ventilation system is not keen enough, unless there is great window space. The muslin gets damp, dust settles on it and often, in a short time, very little air can pass through it. In cold weather the muslin becomes covered with frost and snow, and instead of having a stable with an even temperature and pure

FARM DAIRYING

atmosphere, it is rather likely to be one subject to sudden changes of temperature and ill ventilated.

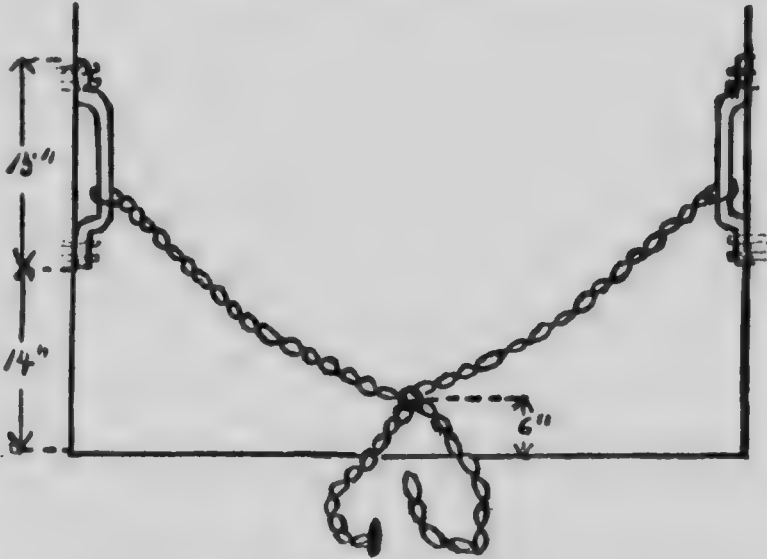
It is probably not advisable to allow the temperature of the stable to fall much below 40° in the coldest weather, but in no case should a high temperature be maintained at the expense of ventilation. If the air of the stable is dry, cattle can stand quite a low temperature without discomfort. Too warm and badly ventilated quarters are largely responsible for the prevalence of tuberculosis. On the other hand a low enough temperature to cause the cows to chill will quickly be shown in a decreased milk-flow. Cows exposed to extreme cold require more grain food and give a smaller yield of milk.

The best floor is made of cement. It is sanitary, durable, and easily kept clean. If bedding is scarce and the floor very cold it is advisable to have a plank platform for the cows to lie on, otherwise rheumatism may develop. This wooden floor must be taken up occasionally and the stalls well cleaned. Many a valuable cow is lost by allowing her to lie on a damp, cold floor with probably a draught on her hind quarters. Inflammation of the udder is the result.

There are many contrivances for fastening the

FARM DAIRYING

cows in the stall. Do not be cruel enough to have the rigid stanchion. The swinging stanchion is being installed in many stables, and is greatly liked. The upright iron bar with the sliding ring



A HUMANE AND MUCH-APPROVED-OF COW TIE

and chain, is, in the opinion of many, the easiest and best kind of tie. A later form of chain tie which is an improvement on the old style, calls for a bar on each side of the stall, and a ring on each bar with a chain on each ring. These two chains are joined in the centre by a ring to which is attached the chain which goes around the cow's neck. The bars are short and should be placed

FARM DAIRYING

with their lower end about eighteen inches from the floor. The side chains should be slack enough so that when not attached to the cow the centre will hang eight or ten inches from the floor. This tie gives more liberty than the stanchion, and does not interfere with the cow when rising.

The basement stable is losing favor, as it is hard to build one and avoid dampness and darkness—two enemies to health.

The ideal cow stable is one without storage loft or cellar and where no other animals are housed. Such a building is expensive and involves more labor in caring for the stock.

In building a new stable, every contrivance to save labor that can be afforded should be installed. Spend time and money in visiting new barns and studying plans. A wise planning means less hired help and more satisfaction in doing the work. Have doors and passages arranged to save steps—even if you find the need of them and have to put them in, after the stable is finished.

A convenient way of bringing the water into the stable and watering the cows; a wide feed passage; a good gutter; mangers easy to keep clean; modern litter-carriers; manure shed with cement floor; silo, feed bins, and root cellar handy, are points to note.

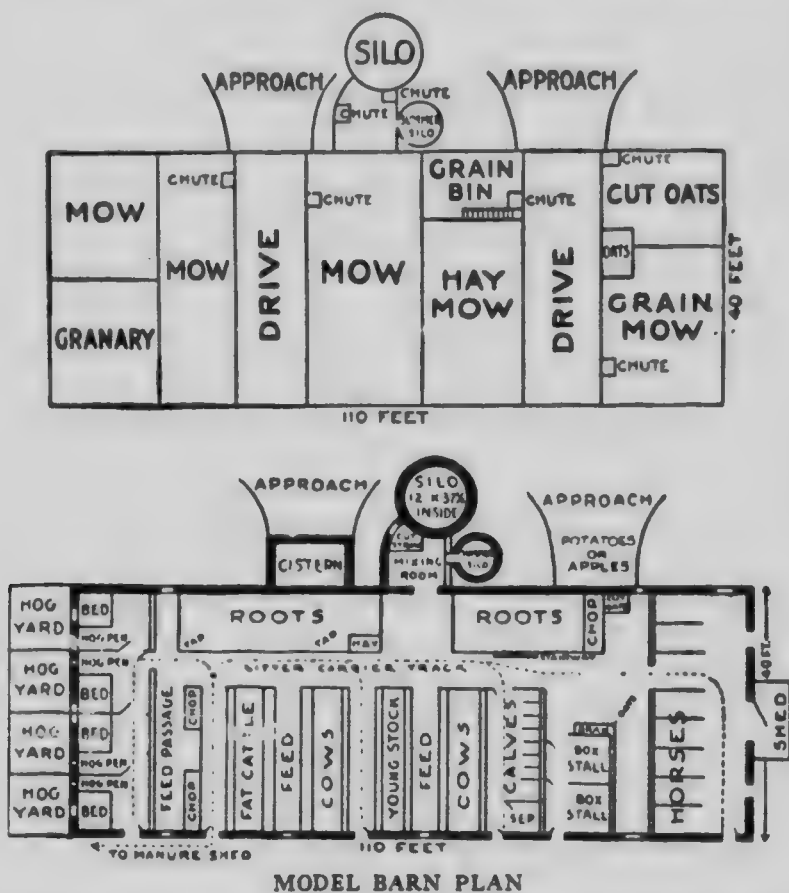


DAIRY BARN, ONTARIO AGRICULTURAL COLLEGE, GUELPH
SHO HAS CAPACITY OF 250 TONS



FARM DAIRYING

If I were a Carnegie I would establish paint factories and furnish, free to all farmers, paint for their barns. Nothing adds so much to the



MODEL BARN PLAN

appearance and general thrift of a homesteading as having all the buildings painted. Besides, the paint greatly preserves the wood. Just a few

FARM DAIRYING

hints on painting. Do not paint in very cold or very hot weather. The lumber should be free from moisture. Work the paint well into the grain of the wood. Have the paint for the first coat rather thin and let it become thoroughly dry before applying the second. Two coats are usually sufficient. If oil paint cannot be afforded, a durable whitewash is a good substitute. It makes old buildings look "most as good as new."

A stable should be whitewashed inside at least every fall. The lime disinfects and sweetens and brightens every corner, and adds to the self-respect of the farmer. Whitewash well strained is quickly applied with a small force-spray pump, or may be put on with a broom.

WHITEWASH FOR OUTSIDE OF BUILDING

Slake in boiling water $\frac{1}{2}$ bushel of lime. Strain so as to remove all sediment. Add 2 pounds of sulphate of zinc, 1 pound common salt, and $\frac{1}{2}$ pound whiting, thoroughly dissolved. Mix to proper consistency with skim-milk and apply hot. If white is not desired, add enough coloring matter to produce the desired shade.

This is much cheaper than paint and gives the buildings and fences to which it is applied a very attractive appearance.

FARM DAIRYING

SPLENDID WHITEWASH FOR ALL INDOOR PURPOSES

To $\frac{1}{2}$ bushel of unslacked lime add sufficient boiling water to slack it, and cover it to keep in the steam. Mix together one peck of salt previously dissolved in warm water, 2 pounds of glue dissolved in 3 quarts of water, 6 ounces of bichromate of potash, and $\frac{1}{2}$ pound of whiting. Add these to the lime, stir well, strain, and apply hot, either with a brush or a spray pump. Add water to thin the mixture so as not to clog the nozzle. A bushel of lime makes 30 gallons of whitewash. Light coats frequently applied are better than heavy ones. While still wet, a light coat may seem to have failed in its object, but when dry it becomes beautifully white.

DISINFECTANTS FOR STALLS, GUTTERS, WALLS, ETC.

No. 1. 4 pounds powdered blue-stone (sulphate of copper).

4 pounds of fresh lime.

40 gallons water.

Use as a spray.

No. 2. Whitewash walls, ceilings, etc., with an ordinary lime wash to which has been added a quarter of a pound of chloride of lime to the gallon.

CHAPTER IV

SUGGESTIONS FOR BUILDING STABLES

SELECT a site where the drainage will be away from the barn and not toward it.

Have the barn in the rear, never in front of the house.

Arrange for a sheltered, sunny spot for the stock to exercise in on bright winter days.

Finish your cement floor with a wooden trowel. In finishing with a metal one the surface is made so smooth that cows are in danger of slipping and injuring themselves. One-half inch from front of cow to gutter is plenty of slope. A gutter ten or twelve inches deep and fourteen to sixteen inches wide is safer and cleaner than a shallower and sloping one. The cows step over the deep one, and are not so apt to slip. If they back into it they soon step up again and learn to avoid going down.

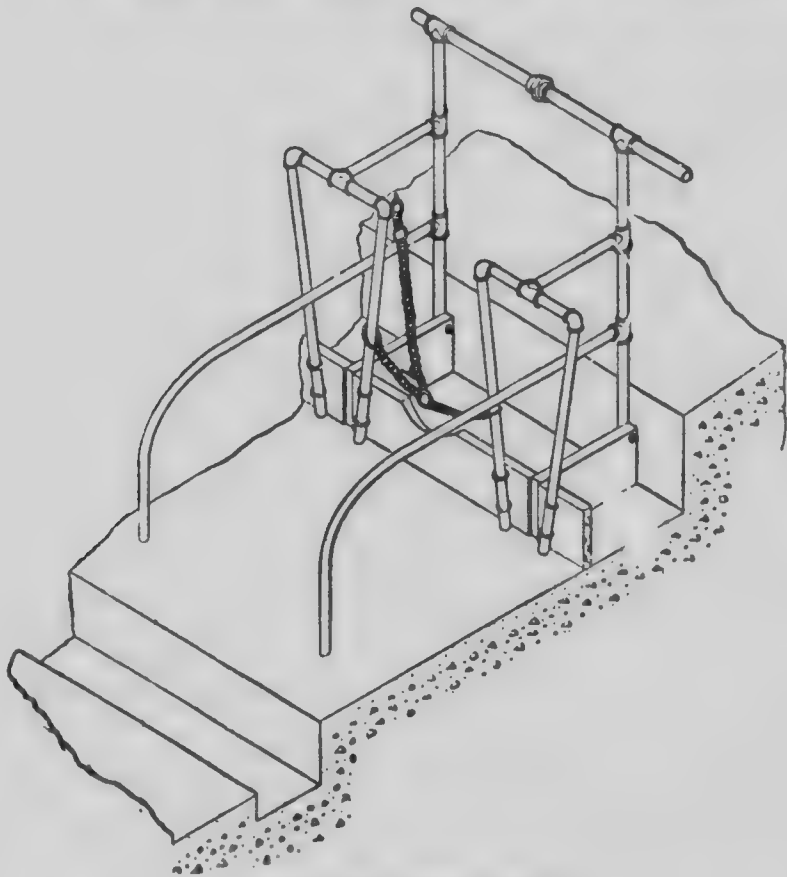
Placing the drinking basin about half way down the stall at the side, just so the cow can turn her head and reach it, prevents to a great extent the soiling of the water by food, and there is no sloping of water on the floor.

Double windows are not necessary. Being too carefully housed weakens the constitution, and

FARM DAIRYING

good air is more necessary than heat. But it is well to have the windows double-paned. The temperature is more easily controlled.

A strong wire screen in front of the manger



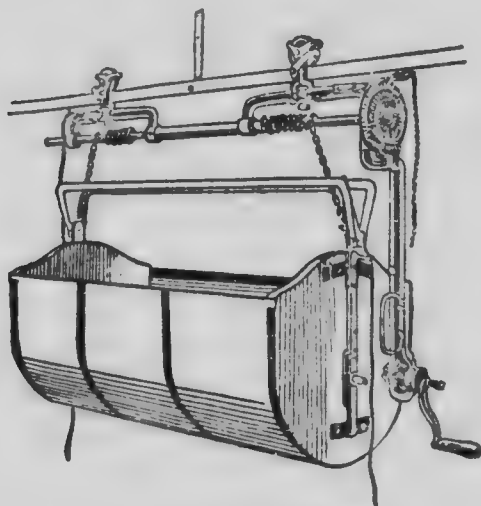
THE NEW IDEAL STALL

This is one of the most sanitary of simple home-made stalls. The guides for the chain-tie are placed at an angle which tightens the chain, drawing the cow nearer the manger when she lies down, bringing her forward, and so keeping her clean.

FARM DAIRYING

keeps the cow from getting too far forward and from throwing the feed out.

Make provision for box stall for sick cows and young stock. A manger for a box stall may be V-shaped, swinging on pivots at the bottom and held shut by a button at the top. When being filled it may be pulled out into the passage and will hang that way until shut.



THE LITTER-CARRIER
A LABOR-SAVING CONVENIENCE

The platform on which the cows stand may be made a little narrower at one end of the row to accommodate the smaller cows.

Have the ceiling nine or ten feet high, and

FARM DAIRYING

closely boarded, to prevent cobwebs accumulating and dust sifting through from above.

Save the liquid manure by making a drain from the end of the gutter to the manure shed. The shed should have a cement floor.

Make a cement sidewalk from the barn to the house. It looks progressive, is smarter to walk on, and certainly pleases the housewife.

CHAPTER V

THE DAIRY BREEDS OF COWS

PERSONAL preference and local conditions usually govern the choice of the breed of the dairy herd. There seem to be special breeds for special needs.

CHANNEL ISLAND CATTLE

If the land is near a city and expensive, and a high-class trade is catered to, then Jerseys would prove a wise choice. They are said to be the most economical producers of milk-fat, and justified this statement at the Buffalo and St. Louis expositions. They give a moderate supply of rich, high-colored milk, which, owing to the large size of its fat globules, creams readily. The Jersey is known as "the butter-maker's cow." The Jersey is a native of the island of Jersey. She is inclined to be small,—average weight about 800 pounds,—very gentle, and makes an ideal family cow. The Jersey is usually fawn-colored, but may be any shade from almost a white to a deep brown.

The Guernsey is similar to the Jersey, but slightly larger and more vigorous, and makes yellow butter than any other breed. The Jersey

FARM DAIRYING

and Guernsey are known as the Channel Island cattle.

HOLSTEIN

If the farm affords abundance of succulent pasture, and a heavy flow of milk is desired, the Holstein should be the choice. This breed has been developed on the rich dike lands of Hoiland, which may account for its being the largest of the dairy cattle; a mature cow will weigh from twelve to fourteen hundred pounds. It is asserted that she can make a gallon of milk at less cost than any other cow, and she is sometimes called "the milkman's cow." The milk is often low in fat content, although breeders are improving the breed in this respect.

The Holstein needs plenty of feed, and owing to her weight she should not have to range very far to secure it. The breed has grown much in favor of late years, and has made many wonderful records.

The Holstein is black and white; sometimes almost entirely either the one or the other color, but more usually definite patches of both. Very rarely they revert to red, which is one of the ancestral colors. The pedigree of calves coming red may be pure, but the calves cannot be registered.

FARM DAIRYING

AYRSHIRE

Under conditions where the land is rough and stony and pasture rather poor, no breed will give as good returns as the Ayrshire. In her native home, Scotland, she inherited a sturdy constitution and an independence which enables her to hunt for a living, but she likewise responds well to good treatment.

The Ayrshire gives a medium flow of milk of average richness, especially adapted for cheese-making on account of its small fat globules, which retard the creaming process — a fact which has designated her as “the cheese-maker’s cow.”

She is medium in size, weighing about one thousand pounds, and is usually red and white, or brown and white, the white predominating. She is a stylish, alert cow, the backward sweep of the horns giving her a distinguished appearance.

MILKING STRAIN OF SHORTHORN

Where dairying is not specialized but a few cows are kept to supply the household with milk and butter and to add to the fertility of the soil, the milking strain of Shorthorns finds its place. This breed has, in Canada, been bred for beef so exclusively that the milking qualities have suffered; but there are great possibilities in this fine



COLANTHA JOHANNA LAD
THE FAMOUS HOLSTEIN BULL



A CHAMPION AYRESHIRE BULL



FARM DAIRYING

type of cattle, with their placid disposition and general good health. They are growing in favor with dairymen. The male calves can be reared for beef, and if anything happens to the cows, they can be easily made ready for the butcher.

The Shorthorn is of English origin; is above the average in size and weight, and gives a medium flow of standard-quality milk. She may be white, red, or roan, or a combination of any of these colors.

OTHER DAIRY BREEDS

Other dairy breeds not so well known are: French Canadiam—natives of Quebec, Canada. A small sturdy type, well adapted to stand the cold of winter, and hunt a living in the rough pastures in summer. These cows resemble the Jerseys, but are usually solid black in color. For their size, they give a good flow of milk that is above the average in quality, equal, in fact, to that of the Jerseys.

The Dutch Belted of Holland are medium in size and fair in milking qualities. They are black, with a broad white band around their bodies.

The Kerry—the Irishman's cow—is a little animal (some not weighing over 500 pounds),

FARM DAIRYING

famous for its hardy character and good milking qualities. Black, but occasionally red.

With the exception of the Shorthorn, the breeds mentioned have been purely of the dairy type.

We have heard a great deal about the dual-purpose cow — one suited both for the production of milk and of beef. The following are adapted for the two requirements: the Shorthorn, the Red-Polled, the Devon, the Brown Swiss.

If dairying is the object, it is best to keep to the dairy breeds. The male calves, if properly fed, make good veal. The cows have already earned their way, and a profit from the carcass at the end of a useful life should not be expected.

When once the breed is decided on, *keep to it*. Nothing gives such a motley herd of unsatisfactory cows as a constant changing of the breed.

The sire should always be pure bred of good milking stock. Too much importance cannot be placed on the influence of the sire in establishing a good dairy herd. The cows need not be pure, but should be good grades.



WORTHY TO BE HEAD OF THE HERD
 JERSEY BULL, OXFORD WRANGLER, A GREAT PRIZE-WINNER, OWNED
 BY LORD ROTHSCHILD



A CHAMPION GUERNSEY BULL



CHAPTER VI

THE COW

“There is nothing to equal the cow in the production of human food — truly, she is the foster mother of the world.”

THE breed is of importance, but the individual cow is what really counts. It is not only the herd which must be considered, but *each cow* in the herd.

Every dairyman should have a certain minimum yearly milk standard, and if after a second trial the cow does not come up to it, she should be discarded — better a vacant stall than an unprofitable cow filling it. Be sure it is the cow's fault, and not yours, before you part with her. Many a good cow is humiliated because she cannot do her best on the slim allowance of food and water and the indifferent care she gets.

When buying a cow it is not always possible to find out the actual yield and quality of her milk. In such a case we must look for outward indications that are likely to bespeak good milking ability.

Some people lay little stress on *form* and place all the emphasis on the *perform*. While we agree with them, yet at the same time we believe the

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form of the typical dairy cow to be a result of the performance at the milk pail through many past generations. One has followed the other as surely as the fruit follows the blossom.

By selection, breeding, and management, the cow with naturally a small paunch, diminutive udder, and ability to give milk for only a short time to nourish her young, has been developed into an animal with big girth, enormous udder, and ability to give a good flow of milk almost continuously. Such is the achievement of man in the animal kingdom. What then must we look for in a profitable dairy cow — points common to all breeds?

Beginning at the nose, we like the nostrils to be large to admit plenty of air to the lungs, so as to keep the blood pure and the cow healthy. The mouth should be large, and the lips firm but elastic. A large mouth is said to indicate a large appetite. Whether this is limited to cow-kind and does not extend to mankind, I know not, but I do know we seek cows with good keen appetites; for, if they do their duty, the more food, the more milk.

From the muzzle up to the eyes should be clean cut and not too heavy. The eyes should be large and bright. They indicate the nervous constitution of the animal, and a cow to be a good milker should have strong nerves.

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The forehead — the space between the eyes — should be wide and dished. The dished effect results from the full eye; and we want the breadth, for there is where the brains are situated. Cows show intelligence in their faces much the same as human beings do. I have fancied, as I looked at a fine cow, that she knew what her business was and did not neglect it. Mark you, when a cow is keeping her jaws going she is working; yes, just as much and just as effectively as a set of stones in a grist mill or a weaver at a loom. She, too, is taking raw material and manufacturing it into a finished product. But to return to her head. The horns should be symmetrical, and not too large. The ears not very large, and when they are turned back there should be seen a yellow oily secretion on the inside. This should also be found on the udder and on the tip of the tail. I have heard that it indicates richness of milk, but more likely it denotes constitutional vigor and thrift. For the same reason, we like the hair to be soft and oily or silky, and when we pull the skin up from the ribs it should be elastic and spring back, and not be thick and leathery.

The neck should be slender and neatly joined to the shoulders. There should be no excessive

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amount of loose, flabby skin on the under part of the throat and neck.

We (and I might here explain that "we" means myself and all who agree with me) like to see the double wedge in the dairy form. From the head she should gradually increase in width toward the hind quarters; then from the shoulders down we like to see her broaden out.

There should be good width between the forelegs, and the space behind the elbow should be well filled out. Just in this part are situated the vital organs—the heart and lungs. A cow narrow between the forelegs is exactly the same as a narrow-chested person—both are apt to be subjects for tuberculosis.

The backbone should be large, loosely jointed, and a little prominent—another indication of nerve power, for in the backbone runs the spinal cord, the chief nerve of the body.

The ribs should be well sprung and long.

The barrel, or body of the cow, should have good length and depth. This is her storehouse, and should be capable of holding large quantities of food.

The cow should be wide and strong across the loins, to support this large paunch, for weakness in this point often causes a sag in the back; the



LADY VIOLA
THE UNBEATEN JERSEY COW OF ENGLAND AND JERSEY



A HERD OF FINE GUERNSEYS



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thighs should be thin and hollowed out, to give plenty of space between the legs; and the flanks should be high, allowing room for a large udder.

Horsemen say, "No foot, no horse." Dairy-men say, "No udder, no cow." The udder should extend well up at the back, and well forward, being strongly attached to the body. The sole of the udder in a cow, especially a young cow, should be level and the teats evenly placed and conveniently long to be milked. The udder should be covered with fine soft hair, should be springy, and the veins should be prominent.

The milk veins coming from the udder and running forward under the body should be large, tortuous, and extending well toward the front before entering the body through what are called the milk wells. Sometimes these openings in the abdominal wall are small, and press the veins, swelling them, and making them appear larger than they really are. In buying a cow not milking, it is well to feel the size of the milk wells and they will be some indication of the size and length of the milk veins.

After the cow is milked out, the udder should hang like a bag of skin, soft and pliable. Occasionally we see a cow with a beautiful udder. After being milked she still has her beautiful

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udder, but has added little to the milk pail. This is known as a fleshy udder and often deceives a buyer.

The escutcheon, or milk-mirror, is considered by some dairymen as an important indication of a cow's value as a milker. The escutcheon is that portion of the hind quarters at the back and top of the udder where the hair points upward instead of downward. It is taken as a good sign when the space covered with such hair is large and when there are several "cores" or "whirlpools" where the hair gathers toward a centre.

The legs should be rather short, should be well placed under the cow and not be coarse in the bone.

Some judges like the terminal tail-bone to reach the hock. The tail is but a continuation of the backbone—the larger and more loosely jointed the vertebræ, the longer the tail. It should taper toward the point and end in a nice full switch.

Summing up the qualities of a good cow, we would say: First, *look for constitution*. It is anything but pleasant to think of using milk which has come from a sickly, diseased animal. Don't you think with me there is a strong relationship between the vitality of the cow, and the vitality of the milk she gives? First, then, let us emphasize

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the necessity of having a healthy cow, as indicated by a readiness for her food, a full bright eye, soft pliable hair and skin, steady, even breathing, and good heart and lung capacity. Then we want good milking qualities as suggested by a strong nervous system, large middle piece, and splendid udder. She should have a quiet, contented disposition, submit quietly to being handled, and should be an easy milker.

A cow should increase in her milk-flow during the first few lactation periods; and frequently there is a slight increase in the percentage of fat as she reaches maturity.

She may be said to be at her best from her fifth to her eighth year, and many do splendid work for many years after that age.

A cow should make from \$30.00 to \$60.00 a year profit. A very good one may make for her owner \$75.00 to \$100.00. The profit may be estimated if the food cost be subtracted from the value of the milk-fat. The value of the skim-milk, calf, and manure, off-set the cost of labor in connection with the care of the cow.

CHAPTER VII

A STANDARD AND A RECORD NECESSARY

THERE is but one way to determine the value of a cow when you have her, and that is to *weigh and test her milk systematically*. This gives proof positive of her profitableness.

Shrewd dairymen are universally adopting this plan.

Receiving good care, a cow should give six thousand pounds of milk, testing at least 3.6 per cent fat, or should make two hundred and fifty pounds of butter in a year. A heifer should reach this amount in her second lactation period. This is not a high standard, but if put into force throughout the country would mean that three-quarters of the cows would be doomed. The average yearly yield per cow is not over four thousand pounds of milk. With such an average, how many very poor ones there must be! What about yours? In nearly every stable there are sleek, gentle cows, who stretch their necks as greedily as can be for mangels and meal, and who walk forth with a leisurely important air to pastures green and luxuriant, the pets often of the herd; and yet if X-rays of the scales and the test

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for fat were thrown on such cows, the revelation would assign them to the butcher's block.

Keeping a daily record gives the owner and his help a personal interest in, and oversight of, each cow. It often results in a severe weeding out of the poor ones and better care for the remaining ones. It makes the work of herd-improvement quicker and surer.

Directions for keeping the record and making the tests are given in Chapter XLVIII, on The Babcock Milk Test.

WHY IT PAYS TO TEST COWS Dairy Division, Ottawa

Year	Number of Cows in Herd		Average Yield Lb. of Milk, Herd		Cash Receipts Per Cow, Herd	
	A	B	A	B	A	B
1907	20	9	6372	4110	\$52	\$34
1808	20	9	7639	4260	68	38
1909	21	9	8325	4720	72	41
1910	20	8	8824	6500	77	57

Increase: A's herd 38%; B's herd 58%.

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INDIVIDUAL COW RECORDS

DESCRIPTION OF COWS				3 DAYS' WEIGHING OF MILK				Total Pounds of Milk Calculated for Month	Per Cent	Butter Fat
Name	Breed	No.	Age	Date of Last Calf	Oct.	1	2	3		Total Pounds
Daisy	Ayrshire	1	1 Yrs.	May 2	A.M.	16	16	15		
					P.M.	15½	14½	15	950	4.1
		2			A.M.					
					P.M.					
		3			A.M.					
					P.M.					
		4			A.M.					
					P.M.					
		5			A.M.					
					P.M.					

Systematically taking a sample of each cow's milk for three consecutive days in each month and testing the composite sample gives a good idea of what the herd is doing.

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CONTRASTS BETWEEN COWS IN THREE HERDS
OF THE SAME COW-TESTING ASSOCIA-
TION, FOR TEN MONTHS, 1910.

Dairy Division, Ottawa.

Herd	Poorest Yield		Best Yield	
	Lb. Milk	Lb. Fat	Lb. Milk	Lb. Fat
A	3510	134.1	6590	212.8
B	5068	243.5	9420	316.3
C	4618	200.6	12960	412.1

Poorest Cow \$46.18.... Value of Milk.... 40.00.... Cost of Feed.... <hr style="width: 50%; margin-left: 0;"/> \$ 6.18..... Profit	Best Cow \$129.60 50.00 <hr style="width: 50%; margin-left: auto; margin-right: 0;"/> \$ 79.60 Profit is 13 times greater with best cow.
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CHAPTER VIII

CALVING TIME

AS good parentage is of great value in the human race, so we look for, and have every reason to expect, cows to be better cows which have come from a long line of heavy-milking ancestors. It is within the control of the breeder of the calf to see that both her sire and dam come of good milking stock. Especially must the head of the herd be a pure-bred, healthy animal, from a good strain of milk-producing stock. When one notes so much carelessness in the laying of the foundation of the dairy herd, too strong emphasis cannot be laid upon starting right.

The best dairy herds are built up by raising the best heifer calves from one's own best cows. Calves from cows that have been in good condition before calving are invariably the strongest. A cow must be well fed and cared for if she is to keep up a flow of milk and at the same time nourish her unborn young. She should have a rest from milking of from six to eight weeks, in order to produce a vigorous calf and do better during her next milking period. If persistent in keeping up her milk-flow, leaving a little milk in the udder,

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and toward the last milking but once a day will usually cause her to become dry. Care must be taken when drying up a cow in this manner, to avoid the udder caking.

Many farmers, as soon as a cow becomes dry, let her hunt her own living or half starve her, excusing their neglect by saying she is doing nothing for her board. Is she not preparing herself to work again every day, for ten or eleven months, besides presenting her owner with a calf?

Some stint the food, fearing milk fever. This is not to be dreaded if the cow is properly handled after calving. The main cause for this frequently fatal trouble is milking the cow out clean soon after calving. Only a little milk should be drawn at a time and this should be done several times a day for the first day or two. This is as the calf would take it, and is following Nature's course. One of the best dairymen I know never touches a cow for the first twenty-four hours, no matter how distended her udder, but just leaves the calf with her.

If milk fever develops, use the oxygen treatment, as advised in the medical chapter.

The cow's food before she freshens should be of as succulent a nature as possible. The grain ration should be limited. Cornilage or pulped

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roots with bran may be given in winter, and rather short pasture in summer, so as to give her the necessary exercise. For several days before the calf is expected, the cow should be kept in a box stall with plenty of clean litter.

Keep a strict gestation table and look at it frequently to know when the cows are due to calve. Allow 285 days for a cow to drop her calf. In ten days to two weeks before due to calve, her udder should commence to fill out. Give her exercise. Her hind legs in walking rub her udder better than an attendant can do, and help to ward off udder troubles. A large full udder may naturally cake when the cow is near to freshening; but this condition need not cause alarm. Take her for a long walk but do not let her chill after returning to the barn. If the udder is very much distended, relief may be given by drawing a little milk at intervals, but care must be exercised in this respect.

See that the bowels are in good condition. If not, give a ration of succulent, laxative food; frequent bran mashes are helpful. In extreme cases a dose of salts and ginger may be given. Many veterinarians prescribe a good dose of salts and ginger just before the cow is due to calve.

It pays to watch the cow that is dry, so as to keep her in health, in order to get a good strong



DE KOL CREAMELLE
HOLSTEIN, WITH A RECORD OF 26,280 POUNDS OF MILK IN ONE YEAR



A MODEL TYPE OF AYRSHIRE COW

FARM DAIRYING

calf and have the cow in proper condition to give a heavy flow of milk.

Some assert that cows coming in in the fall give twenty-five per cent more milk during the year than those which freshen in the spring. After calving, give her all the warm water she will drink. Do not fail in this respect. A nourishing much-liked drink is made by putting a quart of oatmeal in a pail, wetting it with cold water, then filling the pail half-full of boiling water and stirring well. Add cold water till the pail is full and the drink comfortably warm. The cow may have as much of this as she will take for the first few days. Do not overfeed her at first. Give her bran mash and hay. Then gradually feed up to the full ration. She should be kept warm and quiet. If the stable is cold, it is well to blanket her, for she must not take a chill.

Some dairymen take the calf immediately from the cow, but it is the better practice to allow it to remain with the mother for 24 hours. Leaving the calf with the cow allows it to get its first milk in the natural way, and the licking the cow gives it stimulates the circulation of the blood in the young calf. If the calf remain longer, it is harder to teach it to drink, and the cow is apt to fret more for her baby. The calf-pen should be

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where the cows can neither see nor hear the calves.

Sometimes the udder becomes badly swollen and hard. Bathe thoroughly with hot water, wipe dry, and rub with camphorated oil or any mild liniment. The oxygen treatment has proved very satisfactory in cases of swollen udder or garget.

Do not exercise a cow after she calves.

CHAPTER IX

CARE OF THE CALF

THERE is a difference of opinion among farmers as to letting the calf suck the dam at all. Some take it away immediately, but the greater number leave the calf with its mother at least twenty-four hours after it is born. It is always safer to allow it to stay that length of time, unless the cow is known to be tuberculous, in which case the calf should be removed right away, and not allowed to be licked by its mother or to drink any of her milk. Tuberculosis is not hereditary, but may be contracted.

To teach a calf to drink, let it get quite hungry first, then insert two fingers into its mouth and lower its head into the pail. Calf feeders can be bought and are liked by some. If the calf proves obstinate,—and, depend upon it, some surely will,—the milk will cool while your patience is being tried. It must be heated by adding a little hot water to it, for the young baby must not get cold milk, even when it is obstinate. Remember it is *against nature* for a young calf to put its head *down* to drink, so while it is learning this we must be patient. It will help matters at first to raise

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the pail, or better still, a dish, to the calf, if possible. Never feed in wooden pails. They soon sour. Always wash and scald the pails at least once a day. It takes less time than to bother with sick calves.

As a rule it is a good plan to feed the calf whole milk for the first three weeks, though there are many strong ones which would stand the change to skim-milk at two weeks. At first give from six to eight pounds ($2\frac{1}{2}$ to $3\frac{1}{2}$ quarts), according to the size of the calf, twice daily. At the end of three weeks it should get from eight to ten pounds.

In the event of a calf, from any cause, not getting the colostrum (first milk), which is very laxative and intended by Nature to cleanse the bowels of the young animal, it is advisable to feed it with the milk from the freshest, lowest-testing cow you have, at the same time watching carefully to see if the bowels are acting. If not, give about two tablespoonfuls of warm raw linseed oil or castor oil, repeating the dose if necessary.

Jersey milk is often too rich in fat for the calf to do well on it. Such milk should be diluted with water. Or give the calf milk from another fresh cow of low test, if you have one.

"In feeding calves by hand," said an expert stock-raiser to me, "I would never be without a

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thermometer and some means of weighing the milk, as I would far rather let a calf go without a meal than have it get a couple of pounds too much milk, or have it get it at a temperature of 70° , if it had been used to getting it at 90° , which is about right."

Scales of some kind should be in every stable to weigh the milk from individual cows, and these could be used for weighing the milk for the calves.

When heating milk for calves, it is best to place the vessel containing it in a pan of hot water, then there is no danger of its being burnt or boiled. One great advantage of separator skim-milk is that, if fed immediately, it is at the right temperature and is fresh and sweet. Besides, I think the animal heat in the milk has a certain vitality in it. The froth should be removed. It is not good for the calf, sometimes causing colic.

In changing from whole milk to skim-milk, do not be in too great a hurry. Take at least a week to make the change, dropping a little more of the whole milk and adding a little extra of the skim-milk at each feed.

At two or three weeks the calf will begin to eat a little hay, and should be provided with some nice bright clover hay. It should also get a little meal about this time. A good plan is to fill the

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hand with bran and crushed oats and when the calf has finished its milk, hold your fingers for it to suck and while it is doing so, work the meal, a little at a time, into its mouth with your thumb. Another plan is to put a little meal into the bottom of the pail just as it has finished drinking. Some give it a few whole oats. The chewing and mixing of the food with saliva promotes digestion and thrift. A little pulped roots is relished by the calf and tends to keep the appetite keen. If you wish to fatten a calf, give it some fat-producing food, such as a little cornmeal.

A calf at two months old should not get over eight quarts of milk per day; at four months it cannot make good use of more than ten quarts. With this it should get two quarts of mixed crushed grain per day, and all the hay it can eat.

At six months old the milk allowance may be dropped out, or before that time if milk is scarce. Weaning the calf from milk should be slowly done by substituting water gradually. Calves should have fresh, clean water to drink from babyhood to maturity.

Do not forget the supply of salt for the calves. Occasionally put a lump of fresh sod in the calf pen. The calves seem to enjoy a taste of earth.

It is always well to substitute something to

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replace the fat taken from skim-milk fed to calves. When making the change from whole milk, a tablespoonful of ground oil-cake may be added to the milk. If flaxseed is used, and there is nothing better, it should be well boiled and from a half-cupful to a cupful of the jelly added to the warm milk. To make the jelly, take one pint of whole flaxseed to four quarts of water; add a little salt; soak over night, and boil for an hour next morning. Some put into the milk a little of the oatmeal porridge made for breakfast.

In cheese factory districts or where the milk is sold for retail trade, it is more of a problem to raise calves. The experiments with commercial calf foodstuffs, to take the place of milk or fat, have proved them to be no better than many of our common feeds, which are obtainable at a much less cost.

Many of the cheese factories are following the commendable practice of heating the whey. By this means it is returned sweet, and may be safely fed to the calves with very satisfactory results, if the proper substitutes, such as oil-cake, be added to it.

Good calves have been reared on hay tea. Good bright clover hay is put through a cutting box and cut fine, three pounds per day allowed

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for a six-weeks-old calf. It is then well boiled, strained, and a quarter of a pound each of ground flaxseed and wheat middlings added for each calf. It is again boiled and fed at a temperature of 90°. This makes a nourishing, easily digested food. The older cattle relish the steeped hay, so nothing is lost.

A successful dairyman, who sends his milk all off the farm, uses the following mixture to make a thin gruel — a substitute for milk.

100 pounds ground oil-cake.

100 " low-grade flour.

25 " ground flaxseed.

In raising calves it is very unwise to pour the milk into a trough and let them all drink together, as some calves will take three times as long as others to drink a gallon, and these, therefore, go short, while the quick drinkers get too much.

It is best to keep but one calf in a pen. Where this is not possible there should be small stalls made at one end of the pen for the calves to go into during feeding time. At the end of the stall there should be an opening large enough for the calf to get its head through to feed from the pail in the passageway. Provide some means of fastening the calves in for a while after drinking.

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They will not then be so liable to form the injurious habit of sucking each other.

Calves should not be exposed to extremes in weather, and are better to be housed most of the time for at least the first six months of their lives. The calf's skin is tender, and may blister and become very sore if exposed to the hot sun. A nice clean grass paddock, for the calves to be in on pleasant days and warm nights, develops their muscle and keeps them in general good health. When calves sweat badly, there is probably bad ventilation in the stable. Give them plenty of fresh air, even though it be cold, if you want vigorous, healthy calves.

The pen must be frequently cleaned out, be kept dry, and have plenty of litter, or the calves will not thrive and are sure to get some of the many troubles which attack young stock. It is a good plan to sprinkle the floor with land plaster and occasionally spray the pen with a good disinfectant.

SCOURS — OR DIARRHŒA

The most frequent trouble in raising a calf on skim-milk is scouring. The reason of this in nearly all cases is indigestion, due to one or more of the following preventable causes: too much milk; sour milk, when the calf has been used to

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sweet; changing from whole to skim-milk too suddenly; irregular hours of feeding; dirty feeding pails; and dirty wet bedding. The disease frequently begins with constipation, which soon gives way to diarrhœa.

Should the calf begin to scour at any time, give it just about half its usual ration, for a feed or two, and two tablespoonfuls of raw linseed oil or castor oil. Some add twenty drops of laudanum. When the scouring has stopped, gradually increase the feed until the calf is getting its regular allowance.

There are several remedies for scours recommended by different authorities. Of these the most popular seem to be, raw eggs, flour, lime water, black tea, and blood-meal. The latter is highly recommended as a calf feed. About a teaspoonful in the milk is said to be a cure for scours, and if fed regularly is a preventive.

The first year—when she is a calf—is the most important in a cow's life. Stunt the calf, and it can never develop into the profitable cow which good care and thrifty growth would have produced. It is true that the cow is partly born and partly made. Our aim should be to train the calf to make use of coarse foods. It is a fundamental law among dairymen that the calf destined

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for the dairy should never be fed a ration conducive to the putting on of fat, and so they select muscle-forming meals. The beef-forming habit acquired by a young animal remains with it all its life, and must be guarded against.

DEHORNING

Where a large number of cows run together it is probably the safest and best plan to have them dehorned, though it certainly detracts from their appearance. The best time to dehorn is in calf-hood. Calves may be easily dehorned when a few days old. Clip the hair where the rudimentary horns appear and with a moistened stick of caustic potash rub the little buttons of horn until the skin becomes inflamed and tender to the touch. One application is usually sufficient. As caustic potash burns, be careful not to get it on the hands or on the calf's head.

I have written thus exhaustively on this subject, for the reason that *the calf is the foundation of the whole dairy industry.*

CHAPTER X

THE HEIFER

IT pays in more ways than one to be on friendly terms with our animals. You must pet and talk to the young heifer so as to gain her confidence and affection.

Place her early with the herd of milk cows, and watch that no harm befalls her. A sudden fright from a dog or an unusual sight may cause her to lose her calf.

Go through the process of milking her to accustom her to being handled.

See that her calf is removed unknown to her, twenty-four hours after birth. Go into the stall soon after the calf is taken away, groom and caress the young mother; and if she gets the idea that you are the baby, so much the better for the milk pail.

The heifer's udder for a few days after calving is swollen and inflamed and often painful. She is nervous and excited. If you have been in the habit of handling her, she will allow you to gently rub her udder and draw a little milk. The relief thus given will further instal you in her affections, and her last thought would be to lift a foot to kick you. The kicking cow is not born; she is made

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that way by the milker. It is a good plan to clip the long hair from the udder around the teats. When milking this hair is often caught with the teats and pulled, causing pain which makes the heifer kick.

To get gentle cows, there is nothing like raising them yourself. The cow seems to partake of the disposition of her keeper. No dairyman can afford to have a man in his stable who is rough and quick tempered.

If the heifer is thrifty and strong she may have her first calf when from two to two and a half years old. If delayed longer, she is apt to acquire the habit of putting her food into flesh. It is well to delay the coming of the second calf for a few months longer than is usual in the mature cow. This gives the young heifer a better chance to develop, as there is not the extra tax on her during the heaviest flow of milk. It ought not to be necessary to dwell upon the point of feeding a heifer generously. She is as yet immature and must have plenty of good food to build up her own body as well as nourish the unborn calf.

If you wish to establish a long milking propensity, you must be persistent in milking the heifer after her first calf. It is then that the habit of a long or short milking period is formed. Dry her

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up at seven or eight months and it is difficult ever after to get her to milk for ten months. For this reason keep on milking her for ten or eleven months, no matter how little milk you may get.

It is better to have the heavy flow of milk in the winter, when prices are higher and help more plentiful. Cows coming in in November and December go on the grass just when there is a tendency to a falling off in the milk-flow. The change to fresh pasture stimulates the secretion of milk, and it is like a second freshening.

Fall calving is better both for the cow and the calf. They receive better care, and are not so exposed to extremes of weather. It must be remembered that a cow must not be neglected when dry. That is her building-up period, and she should get plenty of good food and be in vigorous condition at freshening time.

CHAPTER XI

THE FEEDING OF COWS

“The old Quaker who sold the cow that did not give as much milk as he claimed, said to the buyer, ‘Thee should have bought my pasture too.’”

IF we are to get adequate returns from our cows, we must give them at all times all the feed they will consume profitably. It should not be a matter of getting them through the winter alive. In such a case they are so poor they lose the very best months of early pasture before they are in fit condition to give much milk. A feeder's aim should be to induce the cows to consume as much food, especially roughage, as possible. There is no greater incentive to good digestion and abundant production than having the animals lie down with the comfortable feeling of a perfectly satisfied appetite.

Palatableness is a feature which cannot be overlooked. The feed must be prepared and given to the cows in such a way that they eat it because they like it; then are the returns the best. Cows like succulent food. Grass is their natural and ideal diet. In substituting, we ought to come as near to it as we can. Corn silage is the best and cheap-

FARM DAIRYING

est and most easily handled succulent food. The cows like it. It keeps them in health and keeps up the milk-flow. Where corn can be grown, no dairy farm should be without a silo.

Variety in the cow's ration is also desirable, and so roots, mangels, carrots, sugar beets, one or all, should be provided. A mixture of pulped roots and silage is better than either fed alone.

If from some failure, no succulent food is available, cut good oat straw, moisten it with water, sprinkle over it a little salt and let stand a while. This makes it palatable and if some meal be added to it, cows will readily eat a considerable quantity. Shredded or cut cornstocks may be put into a silo and steamed or moistened, and thus made more acceptable and digestible; but this is a poor substitute for good silage.

I remember being in a stable in Nova Scotia where fifteen cows were kept, and the milk was sold in a mining town. All foodstuffs were very expensive. The man had no roots, and corn silage was out of the question, but he made a good substitute. His hay, mostly clover, he put through a feed cutter and then into a large water-tight box. In the kitchen, not far from the stable, there was a large hot-water tank. He carried hot water from this and poured it over the cut hay, closed the lid



DUTCH BELTED CATTLE



KERRY COW, SHAMROCK II, WINNER OF MANY MEDALS
AND PRIZES

FARM DAIRYING

tight, let it stand till morning, and added meal and a sprinkling of salt when feeding. He said this method reduced the cost of milk production one-third.

With regard to the meal ration, that depends on the amount of milk the cow is giving, and the kinds of grain used. If it is a good mixed meal, one pound of meal to every four pounds of milk given by the cow is considered about right. Cows giving a good flow of milk usually get from five to ten pounds of meal per day. Several kinds of grain mixed together are better than feeding one straight grain; but if limited to one, choose chopped oats.

The selection of grains depends on their market price and what is grown on the farm. Equal parts of oats, peas, barley, and bran make an excellent and cheap mixture. Some of the more concentrated foods, such as oil-cake, cotton-seed meal, or gluten meal, may be substituted or added. These are high in protein, and stimulate the milk flow. In using these concentrates we are adding greatly to the manure value and get much of our expended money back in increased yield of crop. It is interesting to note in this connection that many of the large landowners in England allow

FARM DAIRYING

their tenants a rebate of one-third of the money expended in oil-cake.

We must ever bear in mind that intelligent feeding is giving the cow the right amount of the materials from which she is able to make milk. A cook might have a barrel of flour and a sack of sugar, but only three eggs; in that case her limit would be the making of but one cake which called for three eggs. A cow may have an abundance of carbonaceous food, but only a limited quantity of nitrogenous or protein food, and the poor creature has to bring her milk production down to the limit of the nitrogenous food, or take it out of her body and go down in flesh.

The best method of feeding is to prepare in the morning enough feed for two meals, mixing the cut straw, silage, and pulped roots together in a pile in the feed room adjoining the stable. Let this stand several hours before feeding. Put the meal on top of this roughage when in the manger. The meal when eaten in this way is better digested; for, if taken alone, it is apt to be carried out of the first stomach by the water the cow may drink, before the digestive juices, which are abundant in the first stomach, have had time to act on it.

Feed twice a day, giving all the cows will eat

FARM DAIRYING

up clean in two hours. After that time the mangers may be cleaned out. A little long hay may be given immediately after the morning and evening feed, or at noon. It is not necessary to feed more than twice daily, having the intervals between feeds of equal length. This allows time for the cows to lie down to rest and quietly chew their cud, undisturbed. In case of heavy milkers, where they are milked more than twice a day, they should be fed after each milking.

Some put salt in the feed, but it is preferable to let the cows help themselves. Salt should always be before them. A lump of rock salt may be kept in the manger. It is necessary for the cows' health. It makes them drink more — a desirable thing from the milk-producing standpoint, and also makes the cream easier to churn.

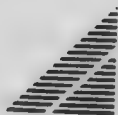
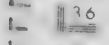
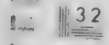
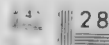
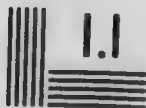
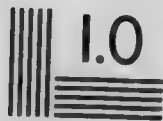
Some cows have the habit of chewing bones, wood, etc. Give them a small handful of fine hardwood ashes in the feed two or three times a week. Such a habit denotes a lack of mineral matter and we must supply it to them. A change of food, or some addition to it, may overcome this tendency.

Cows on good grass do not need any grain, unless in exceptional cases where a record is to be made. Sometimes just a pint or two of meal put



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FARM DAIRYING

in the manger is a good bait to bring the cows willingly from the pasture to the stable to be milked. When they are on the rich fresh grass of early summer, which is very laxative, a little cotton-seed meal may be given as a corrective. The meal will improve the butter by adding firmness to the texture.

A change of pasture is good both for the pasture and the cows. If there is no shade in the pasture, the cows should, if possible, be kept indoors during the hottest hours of the day. Bring them in at noon and give them a feed of silage or meal, then turn them out again after the evening milking. For this thoughtful kind treatment the cows will give grateful thanks by a larger flow of milk. Intelligent care brings a liberal rate of interest.

Where most dairymen need to improve is in providing food for the cows when the pasture gets short and dry. Dairy cows have a heavy drain on them when giving a large flow of milk. They should not have to use time and energy in hunting food, travelling often miles over bare, brown fields, to get a bite to eat. Under such conditions the milk soon decreases in quantity, and when once down it is next to impossible to bring it up to the standard during that milking period. Safe-

FARM DAIRYING

guard against the dry spell, and so add dollars to the profit from each cow.

A small silo to open for summer feeding is coming much in vogue and taking the place of a soiling crop. The latter takes more land, is more wasteful, and takes more time and labor in getting the food to the cows. By all means we would urge the trial of silage for tiding over the sure-to-come shortage in pasture.

Any change from one food to another should be gradual. A quick change is upsetting to the digestion of the cows, and is sure to affect the flavor of the milk. When turning cows on the grass in spring or into a heavy clover field, trouble from bloating, etc., may be avoided if they are only allowed to feed for an hour or two at first, lengthening the time as they become accustomed to it.

Cows that are to take a long journey should be rather sparingly fed the day before, and on the morning of starting should have only hay and water. They will be in better condition and ready for their feed at the end of the trip. Under changed conditions quietness and extra care are essential.

PUMPKINS

Pumpkins are an excellent food for producing

FARM DAIRYING

milk, and cows are particularly fond of them. When grown by themselves they yield an abundant crop, and make a nice variety for fall feeding. Store the pumpkins in a cool dry shed, never in a cellar or root-house.

APPLES

A few apples may be safely given; but if fed in large quantities, they will give a peculiar flavor to the milk. Sour apples are supposed to have a tendency to dry up the milk.

POTATOES

When potatoes are cheap and plentiful they may be fed to cows, but are more profitable when boiled and given to pigs. Potatoes are so starchy that a grain ration rich in protein should be fed with them, otherwise the cows will go down in their milk-flow. Potatoes will make the milk and butter whiter.

CARROTS

Many carrots are grown on Jersey Island for the cows. Carrots appear to exercise a specific action on the milk glands and cause an increased secretion of milk.

CABBAGE

Cows are very fond of cabbage. If the cab-

FARM DAIRYING

bage are sound and a limited amount fed after milking no serious objection is found to the milk. In feeding all such foods, care must be taken or the milk will be off-flavored.

THOUSAND HEADED KALE

On the Western coast this plant is much grown for feeding cattle and is most highly esteemed.

The seed is sown in cold frames then transplanted as one would cabbage, only it stands more hardship than the latter. The yield is marvelous, going as high as one hundred tons to the acre. The individual plant weighs from fifteen to thirty pounds, and one fed each night and morning to each cow makes a much relished, succulent food. Both stock and leaves are eaten. The plant stands zero weather without noticeable injury. Try a small patch and see how it does in your locality.

CHAPTER XII

RATIONS — THE NUTRITIVE VALUE OF COMMON FOODSTUFFS

“A carefully regulated ration will prove one of the best, if not the *very best*, correctives of disease.”

ARATION is the amount of food necessary for a cow for one day. A balanced ration is one in which the carbohydrates, fat, and protein are in the right proportion to each other. One pound of digestible protein to six pounds of digestible carbohydrates and fats is considered about right for dairy cows.

To find the pounds of nutrients in any given number of pounds of any feeding-stuff, multiply the weight of nutrients in one pound, as given in the table, by the pounds fodder, meal, etc., which you expect to feed.

FARM DAIRYING

ONTARIO AGRICULTURAL COLLEGE DAIRY SCHOOL BULLETIN 172

DIGESTIVE NUTRIENTS IN ONE POUND OF SOME COMMON FEEDING STUFFS *

Kind of food	Total dry matter	Pounds of digestible nutrients.			Nutritive ratio
		Protein	Carbo- hydrates + (fat x 2.25)	Total	
Green fodder corn, 1 lb.	0.20	0.010	0.125	0.135	1:12.5
" peas and oats, "	0.16	0.018	0.076	0.094	1:4.2
" red clover, "	0.29	0.029	0.164	0.193	1:5.6
" alfalfa clover, "	0.28	0.039	0.138	0.177	1:3.5
Corn silage, "	0.21	0.009	0.129	0.138	1:14.3
Potatoes, "	0.21	0.009	0.165	0.174	1:18.3
Mangels, "	0.09	0.011	0.056	0.067	1:5.1
Sugar beets, "	0.13	0.011	0.104	0.115	1:9.4
Carrots, "	0.11	0.008	0.082	0.090	1:10.3
Turnips, "	0.10	0.010	0.077	0.087	1:7.7
Timothy hay, "	0.87	0.028	0.465	0.493	1:16.6
Mixed hay, "	0.87	0.062	0.460	0.522	1:7.4
Red clover hay, "	0.85	0.068	0.396	0.464	1:5.8
Alfalfa hay, "	0.92	0.110	0.423	0.533	1:3.8
Corn fodder, "	0.58	0.025	0.373	0.398	1:14.9
Corn stover, "	0.60	0.017	0.340	0.357	1:19.9
Pea straw, "	0.86	0.043	0.341	0.384	1:7.9
Wheat straw, "	0.90	0.004	0.372	0.376	1:93
Oat straw, "	0.91	0.012	0.404	0.416	1:33.6
Corn, (grain) "	0.89	0.079	0.764	0.843	1:9.7
Wheat, "	0.90	0.102	0.730	0.832	1:7.2
Rye, "	0.88	0.099	0.700	0.499	1:7.1
Barley, "	0.89	0.087	0.692	0.779	1:7.9
Oats, "	0.89	0.092	0.568	0.660	1:6.2
Buckwheat, "	0.87	0.077	0.533	0.610	1:6.9
Peas, "	0.90	0.168	0.534	0.702	1:3.2
Corn and cob meal, "	0.85	0.044	0.665	0.709	1:15.1
Wheat bran, "	0.88	0.122	0.453	0.575	1:3.7
Wheat middlings, "	0.88	0.128	0.607	0.735	1:4.7
Low grade flour, "	0.88	0.082	0.647	0.729	1:7.9
Gluten feed, "	0.92	0.194	0.633	0.827	1:3.3
Gluten meal, "	0.92	0.258	0.656	0.914	1:2.5
Linseed meal (new process) 1 lb. .	0.90	0.282	0.464	0.746	1:1.6
Cotton-seed meal, "	0.92	0.372	0.444	0.816	1:1.2
Sugar beet pulp, "	0.10	0.006	0.073	0.079	1:12
Apple pomace, "	0.233	0.011	0.164	0.175	1:14.9
Skim-milk (separator) " ..	0.094	0.029	0.059	0.088	1:2
Buttermilk, "	0.10	0.039	0.065	0.104	1:1.7

* This table is based on Bulletin 154, from Cornell Station.

FARM DAIRYING

RATION USED IN THE DAIRY STABLES AT THE ONTARIO AGRICULTURAL COLLEGE

By referring to the preceding table we find that the ration used in the dairy stables at the Ontario Agricultural College contains digestible material as follows:

Feeding stuffs	Pounds of digestible nutrients				Nutritive ratio
	Total dry matter	Protein	Carbo-hydrates + (fat x 2.25)	Total	
Corn silage, 40 lbs.	8.40	0.360	5.160	5.520	.....
Clover hay, 10 "	8.50	0.680	3.960	4.640	.....
Mangels, 30 "	2.70	0.330	1.680	2.010	.....
Bran, 4 "	3.52	0.488	1.812	2.300	.....
Oats, 4 "	2.67	0.276	1.704	1.980	.....
Oil-cake, 1 lb.	0.90	0.282	0.464	0.746	.....
	26.69	2.416	14.780	17.196	1:6.1
Wisconsin standard	24.5	2.20	14.900	17.100	1:6.8
German "	24.0	2.50	13.400	15.900	1:5.4

By using the table as directed any farmer can readily find out the amount of digestible material in his ration and compare it with the standards given. If he find that the ration is too low in protein or muscle-forming material, then bran, oil-meal, gluten meal, peas, or clover hay should be added to the ration, and if necessary, some of

FARM DAIRYING

the more carbonaceous foods, such as silage, may be reduced. However, silage, roots, beet pulp, etc., give succulency to the ration, which is very important in the economical production of winter milk.

CHAPTER XIII

FODDER CROPS

IT is not difficult to get a large flow of milk from good cows, if it be done regardless of food cost; but in order to do it economically the dairyman must endeavor to grow most of his feed and to make such selection of crops as yield the largest returns for the least labor.

The majority of farmers are attempting to care for too much land. Fifty acres under intense cultivation will bring in more revenue than one hundred and fifty acres farmed by the average man.

The sooner farmers wake up to the advantages of growing alfalfa, the better. Alfalfa is one of God's greatest gifts to the dairyman. It is the first plant green in the spring and the last plant green in the fall. For feeding value it comes nearer to grain than to hay. With plenty of corn silage and alfalfa hay, very little grain is needed to keep up a good milk-flow. One ton of choice alfalfa hay is said to equal one ton of wheat bran in food value.

The land for alfalfa should be clean, good, mel-

FARM DAIRYING

low soil, with a deep-drained, free-from-acid sub-soil.

It has been found by many who have tried it to be particularly successful upon hard clay hill-



ALFALFA SEEDLING SIX WEEKS OLD

sides, which give inferior yields of other crops grown in rotation. While it is a little more dif-

FARM DAIRYING

ficult to secure a good catch of alfalfa on such soil, when once it is established it stands the winter better, is free from injury by standing water or ice, and resists successfully the encroachment of grass, which is the arch-enemy of alfalfa.

Use only plump, pure seed. Inoculate the seed with the proper kind of bacteria, if alfalfa has not been successfully grown on the land. Sow as soon as the land is in condition in the spring, using twenty pounds of the seed per acre; have it in the grass seed box placed in front of the grain drill. At the same time sow one bushel of spring wheat or barley per acre from the tubes of the drill.

Cut the grain when ripe, and get it off the land as soon as possible.

Do not pasture the first season; and for best returns in hay, not at all.

Cut the alfalfa the following year as soon as it starts to bloom. In curing, protect it from the rain, and try to retain as many of the leaves as possible on the stems, for they are exceptionally rich in nitrogen. It is usually cut three times each season. The annual yield of cured hay is often from four to five tons per acre.

Do not pasture or cut alfalfa too close to the



PLACE AND PLENTY



THE THRIFT OF THE DANISH FARMER — COWS TETHERED
AT PASTURE



FARM DAIRYING

ground, as the plants are likely to be killed by such treatment.

Alfalfa produces large and valuable crops for a number of years without re-seeding.

I have written thus strongly of the merits of this excellent plant in the earnest hope of getting those farmers who have never tried to grow it to put in at least a small plot.

Clover hay is one of the easiest crops on our land, is excellent in food value as a milk producer, and a good food to give well-flavored milk and butter. Any objectionable flavor found in rank clover pasture is overcome in the well-cured hay.

Next to clover might be placed hay made of peas and oats. Sow two bushels of oats and one of peas by weight — making a total of 128 pounds of seed per acre. Cut when the oats are fully grown but still green.

To have prime oat straw for feeding it is wise to cut the oats a little on the green side. The straw will then have more feeding value and is not so apt to be rusty.

Corn as a fodder crop is of such importance that it and the silo have a chapter to themselves.

ANNUAL PASTURE CROP

To furnish pasture for cattle in the same sea-

FARM DAIRYING

son in which the seed is sown, extensive experiments at the Ontario Agricultural College have found the following to be most satisfactory:

Oats	51 pounds
Early Amber Sugar Cane	30 "
Common Red Clover	7 "

making a total of 88 pounds of seed per acre. An acre furnishes a much relished pasture for one cow.

The red clover gives a good hay crop the following season.

PASTURE FOR ROTATION OF CROPS

Timothy	4 pounds
Orchard Grass	5 "
Red Clover	7 "
Alsike Clover	2 "

making a total of 18 pounds of seed per acre.

PERMANENT PASTURE

Orchard Grass	4 pounds
Meadow Fescue	4 "
Tall Oat Grass	3 "
Timothy	2 "
Meadow Foxtail	2 "
Alfalfa Clover	5 "
Alsike "	2 "
White "	2 "

making a total of 24 pounds of seed per acre. If

FARM DAIRYING

the land is low-lying and inclined to be damp, substitute 3 or 4 pounds of red-top for the alfalfa.

SOILING CROPS

The mixture of oats and peas already given may be sown and fed off as a soiling crop. It may be put in to advantage at three different dates, at intervals of ten or twelve days between the sowings. This crop, if not needed for green fodder, may be cut and cured as hay. If not required for hay, it may be left to ripen as grain.

Alfalfa and red clover may be cut and fed green to the cows either in the stables or pasture field.

Nothing will prove more profitable than a patch of sweet corn for fall feeding for the cows. Plant it early in a convenient place. Plant thinly so as to have good strong corn. Sugar cane or common field corn also make good autumn feed.

CHAPTER XIV.

SILOS AND SILAGE

“But let the good old corn adorn
The fields our fathers trod;
And let us, for the golden corn
Send up our thanks to God.”

THE cement silo is growing steadily in favor. It is comparatively easy to construct and has a nice appearance on a farm. While costing more than a wooden one, the cement is so much more durable that in the end it is cheaper. When made with the hollow cement blocks, the danger of injury by frost to the silage next the wall is lessened. The silage keeps perfectly if the corn goes in in good condition.

At present the most popular kind of silo is the solid cement wall, usually 9 inches thick at the base and 6 inches at the top. Small field stones are imbedded in the cement as a filler, the inner and outer surfaces of the wall being smoothly finished with the cement. To make the silo air and water tight, after finishing, whitewash it with clear cement. A pointed roof gives the silo a much better appearance than a flat roof and is more convenient. A cement or stone silo should receive

FARM DAIRYING

a cement wash when the acid of the silage has affected the inside walls.

I quote from the Ontario Farmers' Institute Report, 1910:

"My silo is built of cement from bottom to top. We dug a trench $2\frac{1}{2}$ feet wide and down to hard soil. We used cement mortar and large stones to make a foundation, having it level at top of ground so as to set our steel rings on level. The size of my silo is: 40 feet high and 14 feet across inside. The walls are 9 inches at bottom and 6 inches at top. The material required to build this silo was 50 barrels of cement and 50 yards of fine gravel, using no stones above the ground. It is reinforced every 15 inches with a wire rope made of four strands of No. 9 wire twisted together and placed in centre of cement. Eight bolts were placed in top of silo to bolt the rafters to, and thus save making a wooden circle for rafters. The cost of material is as follows:—

50 barrels of best cement, at \$1.45 . . .	\$ 72.50
50 yards of clean gravel, at 15c . . .	7.50
400 lbs. wire	9.00
Labor charged for plastering	5.00
Labor charged for building	77.00
<hr/>	
Total	\$171.00

The builder found all necessary scaffold and rope. It takes three men about nine days to complete a silo if the weather is fine.

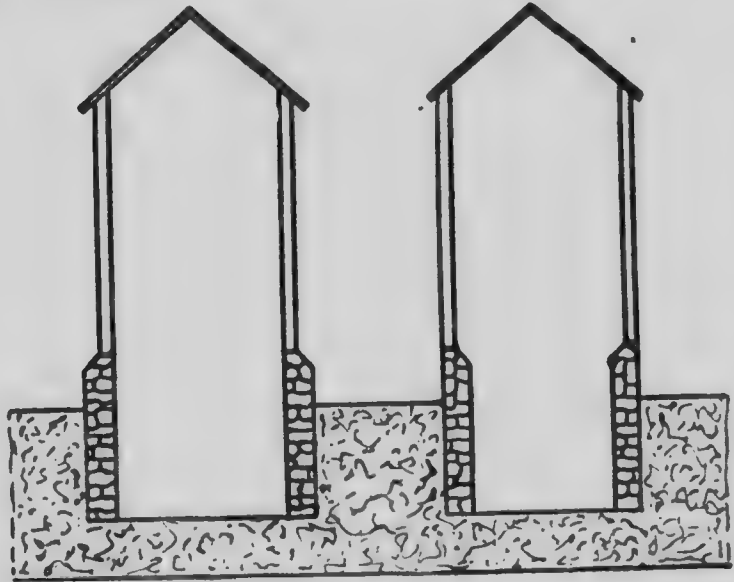
FARM DAIRYING

"Place your silo in the most convenient place possible both for filling and feeding. See to it that you have the drain a little deeper than bottom of trench to carry off any water that might collect. The bottom of the silo should be of earth shaped like a plate, and just before filling place a layer of straw thereon. A floor of this kind allows any extra juice in corn to escape and does not sour the silage in the bottom.

"For filling we have a 13-horsepower engine and a blower box requiring only one good day to fill.

"We have not had one forkful of spoiled silage so far. It does freeze some around the wall, but this does not spoil the silage if fed as soon as it thaws out.

"A roof should always be put on a silo to keep the sparrows from eating all the corn and leaving the cobs for the cows."



FARM DAIRYING

The primary principle in the making of silage is the exclusion of air in order to prevent decay; therefore not only the walls but the doors must be perfectly air-tight.

The walls should not only be tight and rigid but they should also be smooth and straight on the inside to permit the silage to settle without forming pockets. (See diagram on page 88.)

The majority of silos being built have a continuous door which makes it very convenient for emptying the silo. Two-ply boards should be used for the door with tar paper or heavy building paper between and on the edges. Doors on hinges are objectionable.

The deeper the silo the greater the pressure and the larger amount of corn can be stored per cubic foot. A silo should not be less than 30 feet deep or more than 12 or 14 feet in diameter.

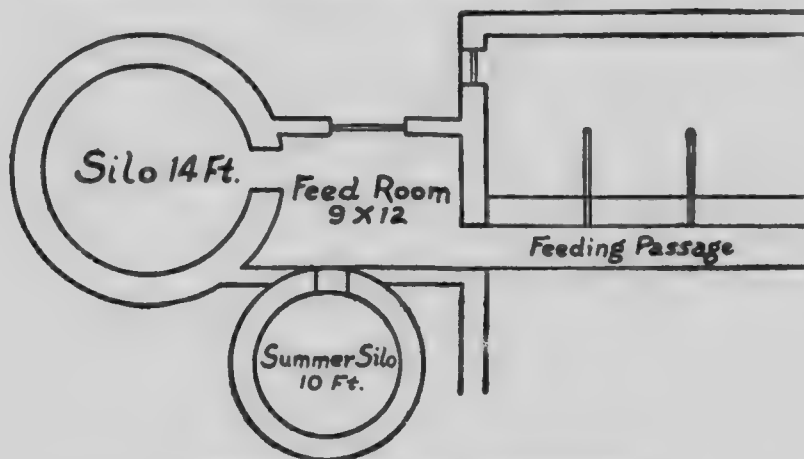
Steel silos are gaining in favor, and seemingly do not hold the frost any more or even as much as the cement ones. The steel, being thin and a good conductor of heat, readily transmits any warmth in the air.

A cement silo costs from \$1.75 to \$2.00 per ton capacity; a round wooden silo from \$1.25 to \$1.50; and a stave silo from \$0.75 to \$1.00, prices

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varying with the quality of material used and the cheapness of labor.

For a herd of twenty-five cows a round silo 15 feet inside diameter and 30 feet high would be about right, or it may be 12 by 40. This size will hold a little more than a hundred tons, which allows four tons of silage per cow, which is about right. Forty pounds is an average for one cubic foot of silage. Some prefer two small silos to one large one. If the herd is not large enough to keep the surface of the silage fed off con-



PLAN OF SILO AND FEED ROOM

stantly and uniformly, more or less of the silage will become injured by mould.

A small silo to open up in the summer when the pasture becomes short is the cheapest and best

FARM DAIRYING

means of keeping up the milk-flow. Every fall more corn is being put into silos to furnish feed for the next summer.

The kind of corn to grow for filling the silo will depend on the locality. To avoid frost, early maturing varieties should be selected. Corn is a sun crop and loves heat, so if planted in rows have them run north and south. Keep the cultivator going till the horses no longer can get through the corn.

When to cut is an important question. If cut too green, there is not the same feeding value in it: it cures with a strong acid flavor and when fed will be rather laxative, and the quantity in the ration may have to be reduced. Better to have the corn a little over-ripe than on the green side. When in condition to cut the ears should be well filled out, and the grain hard. The corn harvester is largely used at the present time, but there are those who still think it pays to cut with a hoe made for the purpose, as it can be cut closer to the ground.

For hauling to the cutting machine, have low trucks and a long rack. A good strong, short-handled fork is best for loading. It is easier on the hands and back. Pile the corn straight on the wagon. It saves time when unloading.

FARM DAIRYING

The best corn-cutting outfit for the average farmer is a portable engine with silage-cutter and blower attachment. Threshers usually have these in their outfit.

If the corn has been badly touched with frost, the sooner it is in the silo the better. If it becomes too dry, it should be sprinkled with water to prevent white mould. A barrel of water may be placed so as to drain as desired on the cut corn in the elevator pipes.

It is desirable to have the distribution of cob and leaf even. The best arrangement for this is to attach a chute from the point where the carrier or blower unloads into the silo, letting it come down to within two or three feet of where the silo is being filled. A boy inside the silo can easily do the distributing then, and there is no fear of his being hit on the head with a flying piece of corn cob. The chute may be of piping, which can be disjoined as the silo fills, or of heavy sacking.

When filled, tramp the silage well around the sides and moisten the surface with water. Some put a good sprinkling of salt on top, others cover with chaff or cut straw, and some sow with oats. The oats grow, form a mat, and help to exclude the air. Perhaps the corn itself is as cheap as any covering. There will always be some waste

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A SILO IN THE FIELD FOR SUMMER FEEDING

FARM DAIRYING

on top. The poor stuff should not be fed. To lessen the waste, some farmers strip the ears from the last load or two of corn, when finishing the filling of the silo.

One may begin feeding as soon after the silo is filled as is desired. Good silage has a not unpleasant acid smell, a slightly sweetish, fermented taste, and should be a brownish green color and free from rot or mould.

If a portion of the silage around the silo becomes frozen, it is more of an inconvenience than a loss. It should be mixed with that from the centre of the silo to allow it to thaw before being fed.

Uncover only as much of the silage as can be used up to the depth of from three to four inches each day, otherwise it is apt to mould and smell badly. A half or one-quarter of the surface may be uncovered at a time. It may be cut down with a hay knife and will mould but slightly.

An acre of ground should produce from twelve to fifteen tons of silage in a good season. The cost, from the tilling of the soil for the seed, to the time the corn is in the silo, is estimated at from \$2.00 to \$2.50 per ton.

The importance of silage as a succulent, coarse

FARM DAIRYING

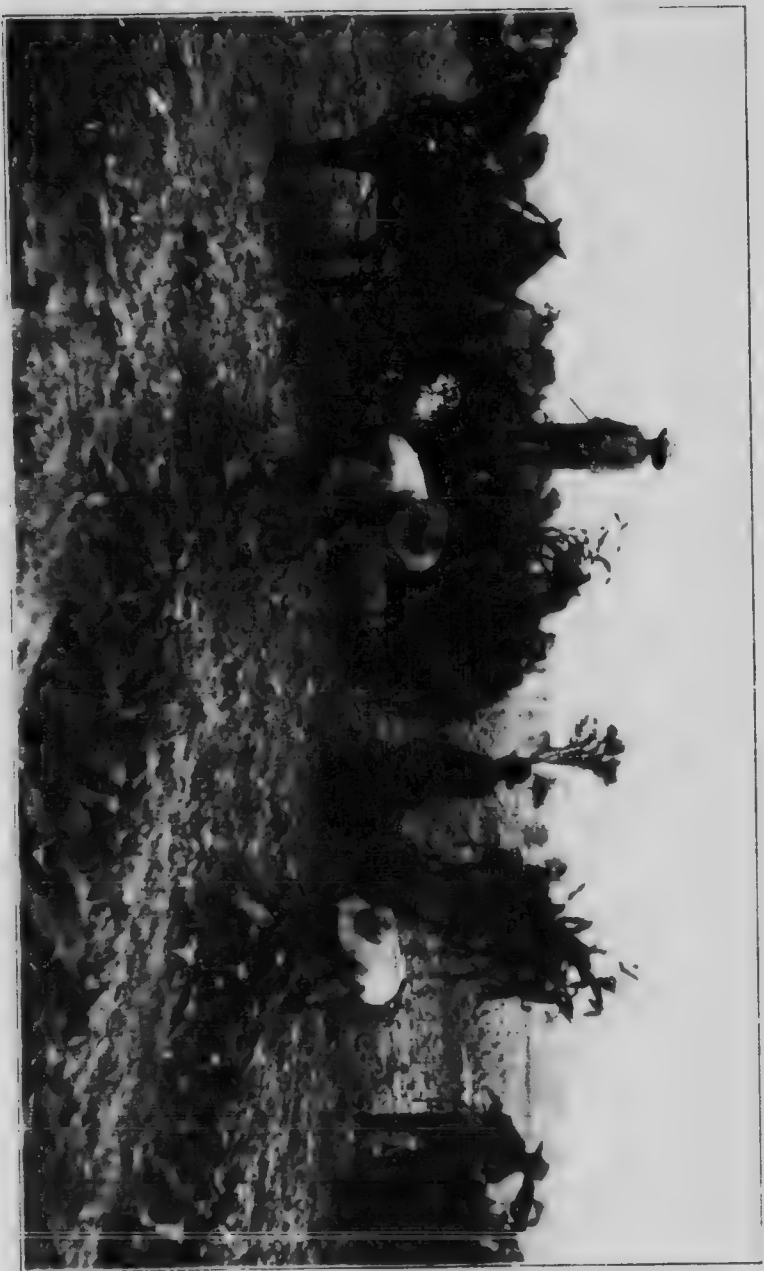
food for all kinds of cattle cannot be overestimated.

CLOVER IN THE SILO

Next to corn, clover is considered the best crop to use for silage. Being of the legume family, it is rich in protein and makes an ideal milk producing food. When made into silage, it has a higher feeding value than when cured as hay. There is less crude fibre, it is more palatable, and all of the plant is saved; while, in making it into hay, the leaves and tender stems, which contain nearly two-thirds of the protein, are broken off and lost in the handling.

The hay should be cut when in full bloom. It is better to be put through a cutting machine. If put in whole it must be spread in layers, otherwise it will be most difficult to get it out of the silo. The clover should be well tramped or weighted, and it is best to have considerable depth to the silo.

In British Columbia much of the hay is saved in this way, and I saw there many silos used for this crop. It is a safe way to harvest the crop when the weather is likely to be wet. Sometimes the farmers of British Columbia simply stack the green clover outside the barn, where it ferments and cures into a splendid feed.



GATHERING THE CORN

CORN STORED IN THE SHED MAKES THE CHEAPEST AND BEST FEED AND FILLS THE MILK PAIL



FARM DAIRYING

Alfalfa is being used for silage with equal success, being still richer than clover in protein.

Cow-peas, soja-beans, sorghum, and various other plants are successfully used to fill the silo.

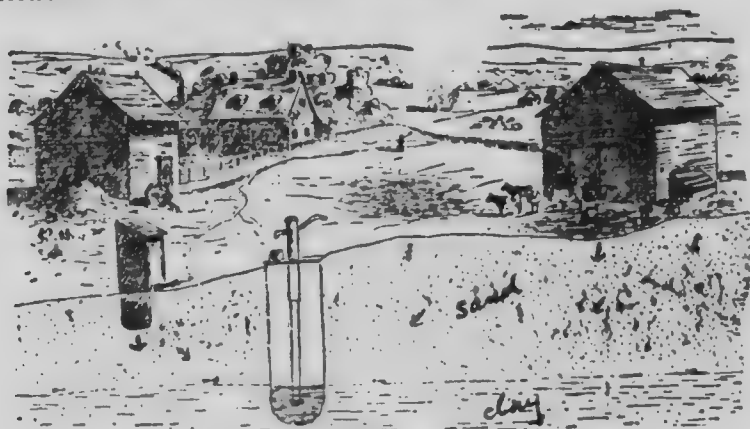
Much less room required for the storing of the same amount of food when placed in a silo. A ton of hay requires 400 cubic feet; a ton of silage, 50 cubic feet.

Silaging the clover crop takes away the anxiety lest the weather should be wet, and where corn cannot be successfully grown, it provides the succulent food so necessary to good health and a heavy milk-flow.

CHAPTER XV

THE FARM WATER SUPPLY

TO those who value the family's health, who wish to have thrifty, strong animals, who desire pure milk and good butter, we would say that it is of primary importance that the water supply be from a source beyond suspicion, and that this source be carefully guarded against pollution. Analyses of water, especially well water, show much of it to be unfit for use.



CONTAMINATION OF WELL WATER FROM SOAKAGE FROM
THE BARNYARD AND CESSPOOL

The pollution is chiefly derived from the drainage from farm buildings and barnyards and unsanitary surroundings.

FARM DAIRYING

When the pernicious practice of sinking the well in the stable or barnyard is followed, the amount of manure, the rainfall, and the porosity of the soil will determine the extent of contamination. Only in very exceptional cases can such a well escape pollution.

The well must be sunk at a safe distance from possible sources of pollution, and be properly constructed to keep surface water, rats, frogs, etc., from getting in. One cannot say how far a well should be located from out-houses and like dangerous sources of harm. For a time the soil acts as a filter, but gradually it becomes saturated with the seepage, which will in time find its way to the well, and the water is sure to be more or less infected. The older the well the greater the danger.

The household slops should not be thrown on the soil near the well, neither should the well be used as a cold-storage receptacle. Something is sure to be spilt into it at some time.

It is better to have the watering trough some little distance from the well, otherwise the horses and cattle are apt to make a muddy pool beside it.

The farmer must have a concern beyond his own family interest, when studying his water supply. The health of large communities is depend-

FARM DAIRYING

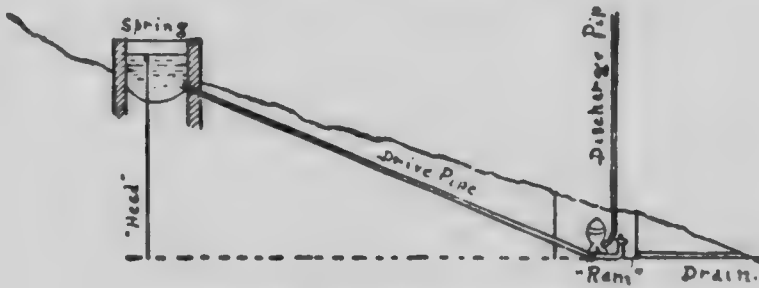
ent to a great extent on the sanitary conditions of our farm homes.

The cans holding milk are often rinsed with the water from a bad well and in this way the milk becomes the medium for carrying sickness into many homes. We should think of the thousands of infants whose only food is raw milk, and of the diseases which may come from bacteria introduced into the milk by impure water, chief of which are typhoid fever, scarlet fever, diphtheria, and cholera infantum. Many serious outbreaks of contagious diseases have been traced to the water supply on the farm. Clear, sparkling water may be just as deadly as that from the muddy brooklet. A well in which the water rises rapidly after a heavy rain should be regarded with grave suspicion. Unless the surroundings be most sanitary for a great distance, the water from such a well is dangerous. *Let the farm water supply receive your serious, intelligent attention.*

Where at all possible, there should be some mechanical means of conveying the water into the house and barn. There is perhaps no greater convenience, and saving of labor, than having a constant supply of good water. It is hard work carrying all the water in and out of the house and pumping the water for the stock.

FARM DAIRYING

Sometimes, without much outlay, a spring on a hill or mountain side can be piped, or a hydraulic ram or a windmill and tank installed. Any one who has a spring within a reasonable distance can install a ram and force the water a long distance and also raise it a considerable height, depending on the fall at the spring. In many farm homes I have seen this system working admirably.



SETTING OF HYDRAULIC RAM

CHAPTER XVI

WATERING THE COWS

I CANNOT see how cows can be healthy and the milk pure, when the former are allowed constantly to drink bad water. Yet a farmer will say, "This water isn't fit for house use, but it is all right for the cows"; or he may allow them to drink from stagnant pools covered with green slime, and in which the cattle stand. If such pools are in the pasture, they should be fenced around. Cattle standing in them get their legs and udders covered with slime and filth, which dries and is certain to find its way into the milk pail.

Cows sometimes seemingly prefer such water to that from a spring or well. This is usually because it is warmer. Cattle have an aversion to taking a quantity of cold water into their stomachs. Again, they may crave mineral matter, and the dirty water contains more of that substance.

Into every hundred pounds of milk the cow puts eighty-seven pounds of water. Dishonest milk-vendors might take note of this and not try to improve on the already generous work of the cow.

This brings us to another point. A cow to keep

FARM DAIRYING

up a heavy milk-flow must have all the water she can drink. Boutsje drank two hundred pounds, equal to two large clothes-boilersful, the day she gave ninety-six pounds of milk. The average milking cow will take from eighty to one hundred pounds of water per day. We should induce the cow to drink plenty. Tests have proved that the milk-flow can be stimulated more by getting the cow to drink copiously than by tempting her to eat beyond her usual. The ideal way is to have water always before her. If this is not convenient, she should get water twice a day. It is poor economy to have to drive the cows some distance, often down a slippery path, to drink from a frozen-over creek. They become so chilled, and the water is so icy, that they take just as little as they can. Dairying will never prove profitable under such conditions.

The water should, by some mechanical means, be conveyed into the stable, or to a trough in some convenient sheltered place. Some farmers have a large tank in the stable supplied by means of a windmill, with water from a well. The water from the tank is never so cold as that directly from the well, owing to its being in a warmer atmosphere before being used.

There are objections to the trough before the

FARM DAIRYING

cows, or the individual open drinking-basins, on account of food getting in them, and the cows slopping the water on the floor. These troubles are largely overcome by having a basin half-way down the stall, so that the cow can turn her head and just nicely reach the basin. One basin does two cows. No matter what form of basin or trough, it must frequently be cleaned out.

A less expensive way is to use galvanized pails, placed at the side of the stalls, so that they serve to water two animals. They may be filled by a hose from an elevated water tank. The pails can be easily removed for cleaning, and, when worn or rusted, may be replaced at little cost.

It is out of the question to talk of tempering the water, but if the chill could be removed the cows would certainly drink more. If I kept but one family cow I would not deem it too much trouble to add a little hot water to her drink in very cold weather.

Colantha fourth Johanna had lukewarm water within reach all the time of her record test — during which time she gave 32.86 pounds of butter in one week.

Salt convenient for the cows increases their thirst.

Good water, and plenty of it, should be the motto.

CHAPTER XVII

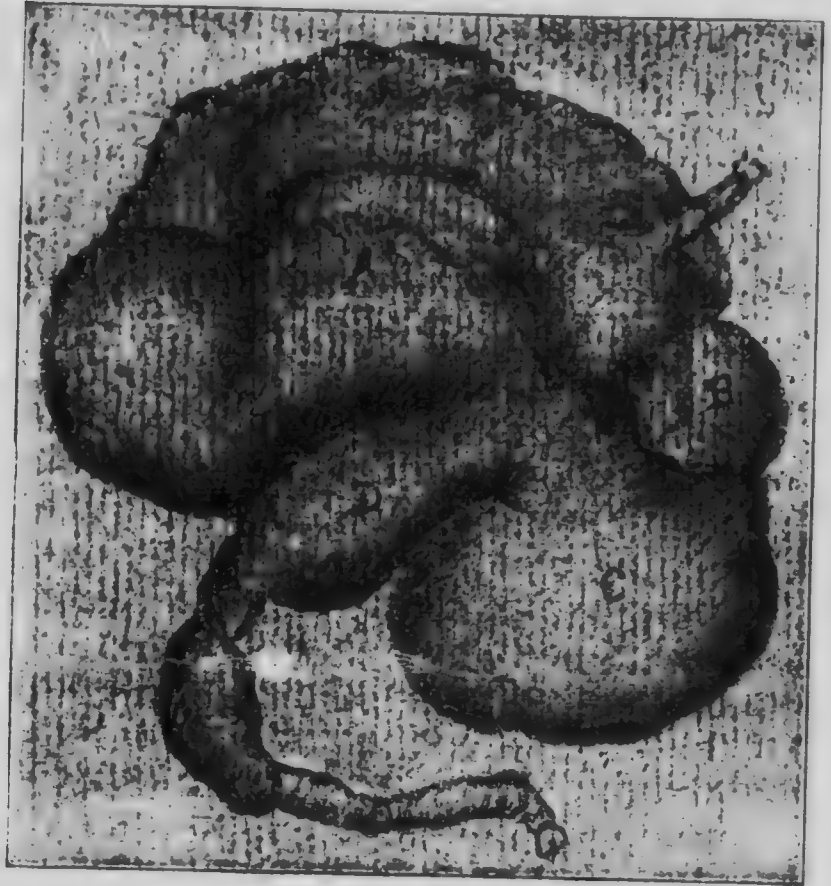
THE COW'S DIGESTION

TO have a cow do her best, under all varying and trying conditions, it is necessary to have some knowledge of her anatomy, especially of the digestive organs, and the construction and function of the udder.

A cow has four stomachs; or she may be said to have one which is divided into four compartments. The first stomach, the paunch or rumen, is by far the largest and will hold thirty-six gallons or more. It is when this stomach becomes full of fresh green feed or a quantity of grain which ferments or swells, that suffocation from excessive bloating may cause death. The lining of the second stomach is full of cavities which give it the name, the "honeycomb." These cells are supposed to be there for the purpose of catching any foreign matter, such as small stones, nails, etc., which a cow might get in her food. In the third stomach the lining is thrown into folds or leaves, resembling the leaves of a book, which has given it the name, the "many-plies." Between these folds, the surface of which is corrugated, the food is rubbed to reduce it further. The fourth and last

FARM DAIRYING

stomach is called the "rennet" or true stomach, and it is here the food is acted upon by the gastric juice. In a calf this is the only stomach which is



COW'S STOMACH

A. RUMEN (FIRST STOMACH) : B. "HONEYCOMB" (SECOND STOMACH) :
C. "MANY-PLIES" (THIRD STOMACH) : D. RENNET (FOURTH STOMACH)

FARM DAIRYING

developed, and it is from this stomach that the commercial rennet is made. As the calf gets fibrous food, the other stomachs develop.

You have watched the placid old "cobossy" lying under a tree peacefully chewing her cud, and have thought what a good time she is having. But she is working diligently all the time.

You notice a lump rising along the side of her neck. That lump is a portion of the softened food from the second stomach, which the muscles of the gullet are forcing upward to the mouth, where it is thoroughly masticated and then allowed to pass down into the third stomach. In this stomach the food is rubbed between the many folds in the lining already spoken of. When the cow gets a quantity of hard, indigestible food, such as dried grass, and little water to drink, the folds of this stomach become packed with this food and the cow is said to be "fardel-bound."

From the third stomach the food enters the fourth and last stomach, where the digestion is further carried on. It then passes out into the smaller intestine, and along its course to the larger intestine.

During this time the various digestive juices have been acting on the food and converting the available digestible portion into a fluid. A portion

FARM DAIRYING

of this fluid is directly absorbed into the blood, but the greater part of it passes into the thoracic duct which empties the fluid into the blood circulation near the heart. The blood, as it rapidly courses through the body, carries this digested matter with it to the remotest parts, to nourish and replace waste of bone and muscle and nerve.

Thus is food made available for the sustenance of the body. It will be noticed that the important consideration with regard to a cow's ration is the digestibility of the food; for it is only that portion of the food which becomes dissolved and absorbed that is available for the maintenance of the cow and the production of milk.

A strong circulation of healthy blood is essential in the dairy cow, if she is to give a heavy flow of milk. A large artery carries the blood from the heart along the back and gives off a branch called the mammary artery, which supplies the udder. The blood-vessels form a fine network through the udder and emerge in large veins in front of it. These are known as milk veins; but it will be seen that they hold blood, not milk, and that they are emerging from the udder, not entering it. When these veins are large and numerous and extend well forward, they are supposed to indicate a good milker. These veins show the

FARM DAIRYING

amount of blood which passes through the udder, and there certainly is a relationship between it and the milk-flow. The tremendous flow of blood through the udder makes it extremely sensitive to sudden changes of heat and cold, and hence the danger of lying on cold, damp ground or cement or stone floors.

CHAPTER XVIII

COMPOSITION OF MILK

AVERAGE percentage of constituents of milk:

Fat	.	.	.	.	3.6	%
Casein	.	.	.	.	2.5	"
Albumen	.	.	.	.	0.7	"
Sugar	.	.	.	.	5.0	"
Ash or Mineral Matter	.	.	.	.	0.7	"
Water	.	.	.	.	87.5	"
						<hr/>
Total	.	.	.	.	100.00	"

Milk is a yellowish white fluid, opaque, slightly viscous, with a faint odor and a pleasant sweetish taste. It is composed of water, and certain other constituents, part of which are in suspension and part in solution.

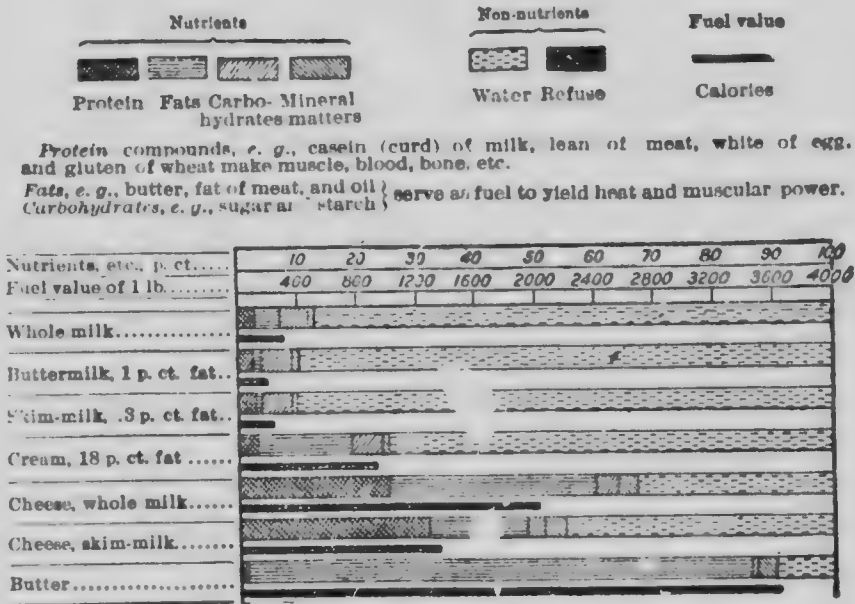
MILK-FAT

The most variable constituent of milk is the fat. It is in the form of minute globules averaging the ten-thousandth part of an inch in diameter. A drop of milk can contain fifteen million of these tiny balls of fat, and yet these are what we gather together to make butter. The minute size of the

FARM DAIRYING

globules is one of the reasons which make the fat of milk, cream, and butter so readily and easily digested.

COMPOSITION OF MILK NUTRITIVE INGREDIENTS AND FUEL VALUE

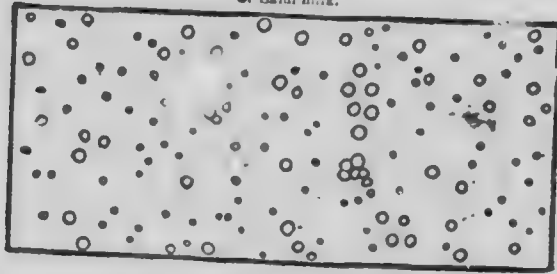


Milk-fat is made up of a number of fats, the chief of which are olein about 42%, palmitin 46%, stearin 4%, butyryn 7%.

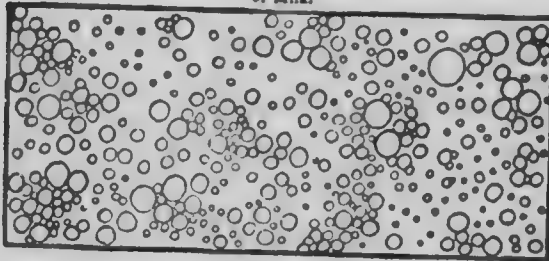
Olein is a liquid fat having a melting point as low as 41°. Palmitin and stearin are hard fats, like tallow, and melt only when heated above 140° F.

FARM DAIRYING

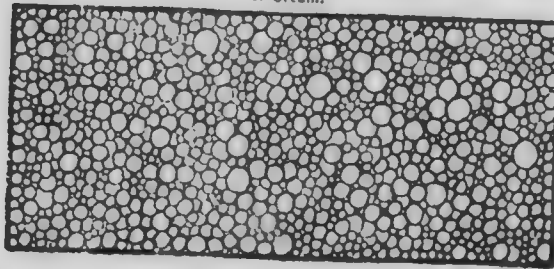
a. Skim milk.



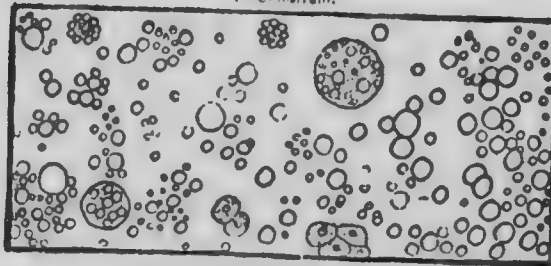
b. Milk.



c. Cream.



d. Colostrum.



FAT GLOBULES IN MILK

MAGNIFIED 300 TIMES

[110]

FARM DAIRYING

Conditions change the percentage of these fats, and this fact throws much light on the great difference in the churnability of cream, and on the texture of butter.

The more olein and the less palmitin and stearin, the lower the churning temperature may be, the quicker the butter will come, and the softer or oilier will be the butter.

The fresher the cows in milk, the softer and larger the fat globules are. The longer in milk, the smaller and more tallowy the globules, resulting in "strippers," making very stubborn churnings and crumbly, tasteless butter.

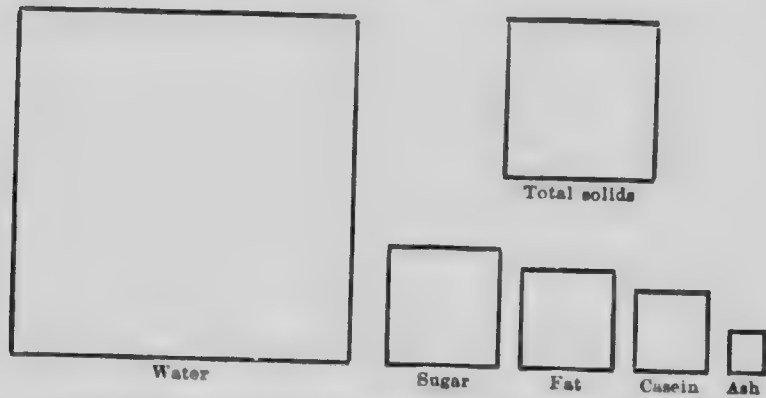
The food of the cow has a marked influence on the composition of the milk-fat. The more succulent the food, the more olein will be in the fat. Grass, corn silage, roots, linseed meal, and gluten meal increase the soft fats; while hay, cotton seed meal, and bran increase the hard fats.

Butyrin is peculiar to milk-fat, and unfortunately readily decomposes, forming butyric acid, which gives butter its rancid taste and odor.

Lactochrome (*lac*, milk; *chroma*, color), the color found in milk, is in the fat. It is influenced by the breed, the feed, the length of time milking, and the individuality of the cow. The Guernsey and Jersey are noted for the high color of their

FARM DAIRYING

milk. White milk does not always indicate poor milk, neither is yellow milk necessarily very rich. I have noticed this to be true when testing samples. Grass, bright clover hay, carrots, pumpkins, and yellow corn meal, tend to deepen the color of milk.



PROPORTIONS OF THE COMPONENT PARTS OF MILK
(AFTER PEARSON)

The percentage of fat in the milk cannot be systematically and permanently influenced by the food given to the cow. Rich foods may stimulate the production of fat for a short time, but the cow will return to her normal percentage and perhaps — due to forcing — fall below it for a while. At the same time, the percentage of fat in milk is by no means constant. The length of time since freshening, sudden changes in weather, sickness, excitement or fright, change of milkers, night's and

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morning's milk, may be caused for a rise or fall in the percentage of fat. I have tested cows which have varied as much as two per cent in two days.

Milk-fat, when taken as food, produces fat, heat, and energy.

CASEIN AND ALBUMEN

Casein and albumen are the nitrogenous, muscle or flesh-forming constituents of the milk, and are largely in suspension, though partly in solution. Casein is precipitated either by the formation of lactic acid or the adding of any other acid, or rennet, to the milk. It is often spoken of then as curd, and is the most important part of the milk in the manufacture of cheese. The albumen of milk is similar to that found in the white of an egg or in blood, and becomes hard and insoluble when heated over 180 degrees. This is why raw milk is more digestible and nutritious than cooked milk. The scum which forms on milk, when boiled, is largely albumen.

MILK SUGAR

Sugar is the most constant constituent found in milk. Five pounds in every hundred pounds of milk is a goodly proportion, when we consider there is but thirteen per cent of solids altogether.

FARM DAIRYING

Milk sugar is not nearly so sweet as ordinary sugar, neither is it so subject to alcoholic fermentation. It is prepared from whey, and is used commercially to sweeten patent medicines and baby foods. Sugar, like fat, produces fat, heat, and energy, in the body. It is the sugar in the whey which makes it valuable for feeding purposes.

ASH OR MINERAL MATTER

If we boil some milk till no water remains, then let it burn, we shall have as a residue in the dish a small quantity of light gray, fine ashes. This substance is the mineral part of the milk and is composed of potash, lime, soda, magnesia, phosphates, etc., the bone-forming elements.

WATER IN MILK

In every hundred pounds of milk there are eighty-seven pounds of water, the same as from a spring. This seems a large percentage; but milk being the sole food of the young mammal, the water is necessary to supply the blood with the required fluid to carry the building-up materials to all parts of the body, and also to fill out the tissues. Milk, by its composition and its functions in the economy of the body, may be seen to be a perfect food; one able not only to sustain life but



PONTIAC RAG APPLES, THE COW THAT SOLD FOR \$8,000
NOTE THE MAGNIFICENT UDDER AND PROMINENT MILK VEINS



THE WORLD'S PRIZE COW, MISSOURI CHIEF JOSEPHINE
GAVE IN SIX MONTHS 17,008.8 POUNDS MILK; IN ONE DAY, 110.2
POUNDS MILK; AVERAGE FOR 182 DAYS, 11.6 GALLONS

FARM DAIRYING

to furnish material to build and repair every part of the infant body.

COLOSTRUM

The fluid the cow yields directly after calving is known as colostrum, which differs essentially in composition from normal milk, and is usually considered unfit for human food. Colostrum, or biestings, as it is sometimes called, contains so much albumen, sometimes as high as fifteen per cent, that when heated it becomes perfectly thick and looks like a rich custard, for this new milk is also high in color, and has a rather strong odor.

The milk gradually loses its colostrum character, and in from five to ten days after the cow has freshened, is generally normal.

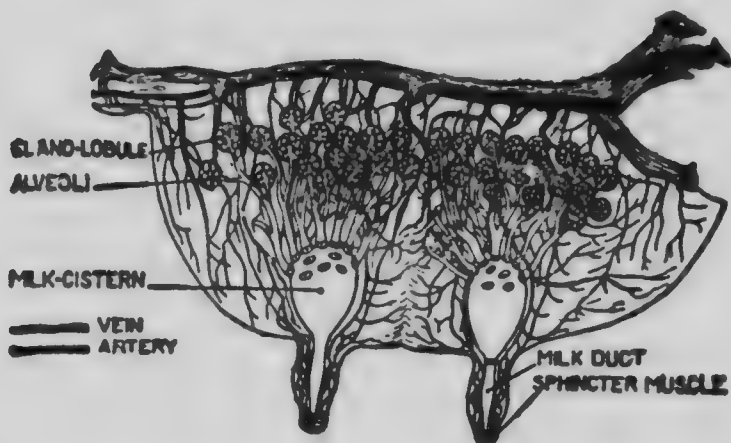
Average composition of colostrum:

Water	.	.	.	.	74.7	%
Fat	.	.	.	.	3.6	"
Casein	.	.	.	.	4.	"
Albumen	.	.	.	.	13.5	"
Sugar	.	.	.	.	2.7	"
Ash	.	.	.	.	1.5	"
						<hr/>
Total	.	.	.	.	100.0	"

CHAPTER XIX

THE UDDER AND THE SECRETION OF MILK

THE udder, the glandular organ in which the cow secretes her milk, is made up of arteries, veins, nerves, tissue, and fat. When cut, it has a soft, spongy, pale grayish pink appearance. There is a partition running lengthwise through the udder dividing it into two distinct and unconnected parts. If a cow lose the use of one of her teats, the milk may be largely drawn from that quarter through the other teat on the same side; but if an accident



CROSS SECTION OF COW'S UDDER, SHOWING THE CELLS
IN WHICH MILK IS SECRETED

FARM DAIRYING

happen to both teats on the same side, half of her usefulness as a milker is gone.

The birth of the young is the primary incentive to the secretion of milk by all animals which suckle their young. In the wild animals and in the scrub cow the udder is small and imperfectly developed, and secretes milk only for a few months. Intelligent feeding, selection, and breeding have resulted in an enormous development of udder, and an almost continuous milking period in the best cows.

There are two general theories advanced in regard to the secretion of milk. The metamorphic (meaning *change of form*) claims that the milk is due to a breaking down of the cell structure of the udder. We can hardly accept this, for it would be almost impossible for a cow to build up and break down the cells to the extent of as high as from fifty to one hundred pounds of milk per day.

The transudation, or filtering, theory claims that the milk filters or oozes through the tissues from the blood as it courses through the udder. Neither can this explanation be wholly true, for constituents found in milk are almost lacking in blood — fat, for example.

A combination of these two theories appears reasonable. As the blood courses through the

FARM DAIRYING

udder, from it are taken substances to build up thousands and thousands of tiny cells stored with materials which afterwards form the greater portion of the solid constituents of the milk. All day long these cells keep developing, and the udder grows larger and larger. The blood is charged with an extra supply of water.

The cow has now the materials in readiness to make the finished product, milk. We have provided her with food and water. With these she has carried on the manufacturing process to a certain point, but she needs some outward assistance to finish the work thoroughly. She gets this assistance from the calf, when it presses the teat in its mouth, or from us when we likewise squeeze it in our hands.

We place our hands on the teats thinking we do so in order merely to draw the milk, but we do much more than that. We are co-workers with the cow in helping her to make the milk, and the better we understand our part of the business the larger will be the returns.

The materials for the milk are stored in the cells of the udder and in the blood. Its final secretion is brought about by the action of the nerves; hence the great importance of the nervous constitution. If a cow were giving ten quarts of



AYRSHIRE HEIFER
GOOD LOOKING AND GOOD



WELL BRED AND WELL FED, THE PROMISE OF A GOOD COW

FARM DAIRYING

milk at a milking, and she were killed just before being milked, there would not be found in her udder or any other part of her body more than a quart of milk. Too much stress cannot be laid upon this fact that *the making of the milk is largely completed just at the time of milking.*

Intelligence and kindness on the part of the milker at this time determines, to a great extent, not only the quantity, but also the quality of the milk.

When we press the teats we excite the fine network of nerves in the udder. These nerves act on the cells, breaking them down. At the same time the water filters through the tissues, carrying with it the mineral matter from the blood. The materials from the broken-down cells and the water unite to form milk, which finds its way through the minute channels to the milk cistern at the top of the teat, whence the milk is drawn by the downward pressure of the hand on the teat through the teat canal, and escapes. It takes the fat globules longer to get to the outlet, hence the reason for the richness of the last milk drawn.

Milk is a product which is subject to remarkable changes while in the body of the animal secreting it. Intense pain, fright, anger, all leave their traces in the milk. In the human mother the

FARM DAIRYING

first two of these have been known to infuse the milk with poison and to cause convulsions, and sometimes the death of the nursing baby. It is reasonable to suppose that what is true of the human family applies more or less to such a highly developed, sensitive animal as the dairy cow.

Some cows leak their milk. This is due to the muscle at the teat-opening being too lax. It may be remedied by a rather risky operation. (See Medical Chapter.) Other cows are very hard to milk, the muscle being too tight. Remedies are given for this defect also.

The flow of milk is usually greater in the morning and the percentage of fat slightly lower than at the evening milking.

CHAPTER XX

MILKING THE COWS

CHILDREN or weak-handed persons should never milk good cows. They have not the strength in their hands to press the teats hard enough to excite the nerves sufficiently to get all the milk. Poor milkers are too often the cause of the cows not filling the pail as they should.

Did you ever think why a calf or a lamb bunts its mother when getting its supper? The milk was not coming fast enough to suit the little animal, and instinct taught it that by giving a bunt or two the milk came quicker — the nerves were thereby excited. Some milkers might take a lesson from the calf, and instead of trying to get the udder as well as the milk into the pail, let them press upward instead of pulling downward so hard. The udder is less likely to become injured or unshapely.

Much might be said in favor of women as milkers. The withdrawal of women from the cow stable has been detrimental to the dairy industry. A woman has naturally greater patience and more innate kindness and a higher ideal of cleanliness than a man. The exercise of these virtues tells

FARM DAIRYING

on the cows and on the milk-flow. Milking comes at such inconvenient hours for the housewife, and her duties are already so manifold, she should not be asked to go to the stable to milk. Moreover, many stables, I am sorry to say, are not fit for her, with her skirts, to enter. It is well for the women on the farm to learn how to milk, so that in case of sickness or absence of the men, they may attend to the cows.

On the farm, very often the first chore in the morning is the milking. The man takes the pails and goes to the barn. He sits down to milk a cow and at the same time another man begins putting down hay and filling the manger and after that starts to clean out the stable. The air is laden with the night breath of the cows, the odor and gases from the lifted manure, and the bacteria-laden dust of the hay.

The milk passing through such an atmosphere *can* and *does* absorb and carry with it impurities which seriously injure its quality and produce the "cowy" flavor, bitter flavor, etc., so often found in milk, especially in winter.

Better to have a dirty floor than a dirty atmosphere in a stable at milking time. The milk does not touch the floor but it passes directly through the atmosphere. If you want pure milk the air

FARM DAIRYING

must be pure in which it is milked. Some of the best dairies have separate milking sheds into which the cows are taken to be milked.

To secure clean milk the cows should be brushed down. The grooming is necessary, not only for the increased health and comfort of the cow, but for the good of the milk. The quantity of dirt which falls from the ungroomed cow's body into the milk pail, accounts largely for the dirty sediment at the bottom of the milk pitcher. The curry comb and brush are doubly necessary when the cows are stabled. The stables should be cleaned and ventilated, and a little land plaster or other absorbent sprinkled in the gutters. Just before milking begins, the udder should be wiped with a damp cloth, and if soiled, washed with warm water.

The milker should have on a suit of washable material, which should be washed when dirty. I like the long linen dusters I saw dairymen wear in England. These coats are easy to slip over the other clothes. When milking, the tails are brought around over the knees to protect the trousers. The coats could be made of coarse factory cotton or colored duck.

The milker's hands should be clean and free of disease. Do not milk with wet hands. Some

FARM DAIRYING

milkers have the bad habit of moistening the hands with the first streams of milk. The first streams should neither go on the hands nor into the pail. The milk in the udder proper is practically free from germ life, but as the cow lies down on the never-too-clean floor, bacteria of the worst form find their way through the opening at the end of the teat, and in the milk in the teat canal they gloriously thrive and multiply. This is the milk that should go into a small tin for the barn kitty. While bad for the milk supply, I have never known it to kill a cat. Do not milk it on the barn floor, or in a few days you will have a most offensive smell arising. A good practice is to rub the hands with a little vaseline or lard. This takes the place of wetting with milk, arrests any particles which might fall from the teats, and also keeps the teats from chapping.

If either the fore or back portion of the udder is poorly developed, milk that part first in the hope of stimulating the nerves and overcoming to some extent the deficiency.

Always milk the cows in the same order. If you milk Spotty first to-night, go to her first next morning. She may get cranky and hold up her milk if you pass her by and go to Blacky.

Milk as nearly as you can at the same hour, hav-



A TYPICAL HEAD



HEAD OF PRIZE BROWN SWISS HEIFER

FARM DAIRYING

ing equal distances of time between the milkings. Cows giving a very heavy flow of milk are often milked three or four times during the twenty-four hours.

Milk in the same place; and there is no better place, summer or winter, than a clean stable. The manure-covered paddock or dusty barnyard or roadside is no fit milking-place.

If one has a night pasture near the barn, the cows, after being milked in the evening, may be turned into it, and are handy to bring in in the morning.

Cows get accustomed to a milker and it is better for the same person to milk the same cows. Some cows are so particular in this respect that they refuse to give their milk to a stranger. In some large dairies it is a practice for the milkers to milk the cows in succession. This is to avoid poor milkers spoiling certain cows and to prevent the cows forming a preference for certain milkers.

HINTS FOR BEGINNERS

To those just learning the art of milking, a few suggestions may be beneficial. A person before entering the stall or touching the cow, should speak to her in a gentle tone, calling her by name. The milker should sit close to the cow's right

FARM DAIRYING

side, and first rub the udder with the hands to stimulate the nerves. Many milkers milk the right back teat and the left front teat first, then the left back teat, and the right front teat. Milking opposite quarters in this manner there is no full quarter in the way.

Close the fingers gradually over the teat, beginning at the top, and press the teat more against the cushion of the thumb than into the hollow of the hand. If the teats are short, the milking has to be done at first with the thumb and two fingers until there is room for the whole hand. When stripping, press well up into the udder with the thumb, so as to bring the last milk out of the milk cistern at the top of the teat. Do not pull or press too hard on the teats, but be sure to get all the milk there is if you wish to keep up the milk-flow. Thorough milking develops the udder.

If there be any lumps or soreness in the teats, or bloody, unnatural-colored milk, the milk from those quarters should not be mixed with the rest.

Much udder trouble is caused by bad milkers bruising the teats or udder, thus causing inflammation and more danger of losing a teat than from garget.

THE MILKING PAIL AND STOOL

Never use a wooden milk pail, as the milk gets

FARM DAIRYING

into the pores of the wood and the pail soon becomes foul.

The flaring pail is justly condemned, for its wide diameter presents such a large area for allowing hairs, dust, etc., to fall into the milk during milking. Of all the inventions, the Freeman pail, with its hooded top and small opening, meets with the most approval. Samples of milk taken from the flaring pail and the hooded pail show a marked decrease in the bacterial content in favor of the latter. Dairymen who are striving to improve the purity of their milk, will take a long step in that direction by getting the hooded pails.

It is necessary to have handy milking stools. They should be washed, when dirty, and kept in a convenient, clean place.

Many milkers prefer about a foot of 3" x 3" scantling, with a board nailed on as a seat; some knock the bottom out of a small strong box; many still adhere to the three-legged style; while others have the more elaborate kind with a rest on which to place the pail. The last-named protects the pail from becoming soiled and also prevents, to a considerable extent, the milk from spattering.

To keep the cow from switching her tail during milking, nothing is so convenient as a hoop made from 5 or 6 feet of heavy rope. This thrown over

FARM DAIRYING

the rump does away with the annoyance of having the tail strike you in the face. A piece of cord, with a small weight at the end, tied to the rope and twisted around the tail, makes the hoop more effective. The pinching device, shown in the other cut, is more sanitary.

KIND TREATMENT AND EXHAUSTIVE MILKING

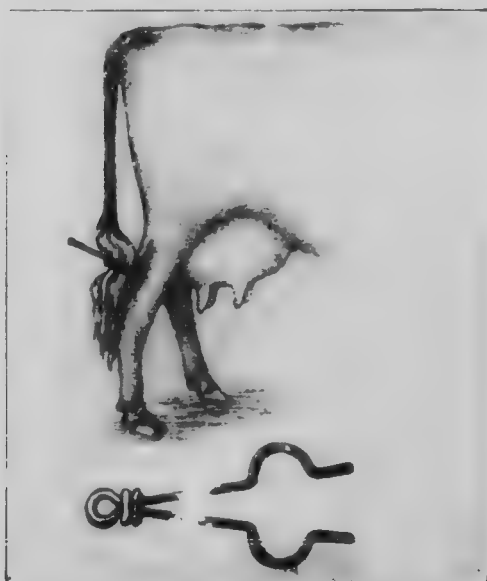
To return to the milking. It should be done quietly and vigorously throughout the entire process. There is no more effective way of drying up a cow than leaving a little milk in her udder; besides, it pays to get it all, for the last-drawn milk contains as high as from 10 to 12 per cent of fat, while the first has only about 2 per cent.

Do not return to the cows to strip them again. It does them no good, but rather an injury. Just here, lest I forget, do not save the strippings by themselves to add to the cream can. They lower the percentage of fat in the cream, and if added warm, injure the quality of both the cream and butter.

No rough noise should be allowed in the dairy stable. I have known loud talking to affect the quality and quantity of milk from a sensitive cow. Cows like to be kindly talked to, and singing has a charm for them. In Switzerland dairymaids



ROPE HOOP FOR PREVENTING COW FROM
SWITCHING TAIL DURING MILKING



CLIP FOR FASTENING COW'S TAIL

FARM DAIRYING

who can sing sometimes receive higher wages than those who are not musical.

The day has forever passed when the progressive dairyman allows his cows to be brought running or excited into the barn by a dog, or by a boy with a whip. Harsh treatment, chilly winds, cold rains, worrying flies, in fact anything that excites, irritates, or brings discomfort to the cow, decreases very materially her profitableness.

A cow should soon learn that her keeper is her best friend — ever mindful of her comfort. Speak to her in a kind voice and pet her. If you are milking her and she steps on your foot, do not give her a knock. She did not intend to be rude. She just could not see how large, or just where, your foot was. Learn to govern your temper; it will bring dollars to your pocketbook.

If you abuse a cow she will get even with you. You say, "The ugly old thing is holding up her milk," but how often is it the case you were the first to be meaningly ill-natured! If a cow gets frightened, nervous, or fretful, the nerves in the udder become tense and refuse to act on the cell structure, and the milk cannot come, for it is not being made. In such a case try to quiet the cow by diverting her attention. Rub her behind the ears. Talk to her. Get her mind back to her

FARM DAIRYING

business by being kind to her. Blows or harsh words only increase the difficulty. Gentleness wins her over.

Sometimes from no apparent cause a cow holds up her milk persistently. A heavy weight, such as a bag with sand in it, placed over the loins may relieve the tension.

It is not well to form the habit in the cows of eating while being milked. If they become accustomed to being fed at that time they will not let down their milk so freely if the food is withheld; but if from the first they are milked before feeding, they do as well, and it is better for the milk, as there is less food odor and less dust in the stable.

SHELTER FOR COWS

Exposure on cold days or nights results in a decreased milk-flow, a general lack of thrift, shown by the staring coat, and a poorly nourished calf. Cows must be kept comfortable at all times. Lying on the cold, wet ground is certainly injurious to the highly developed mammary organs, which are very sensitive to climatic changes.

KICKING COWS

Kicking cows are usually made so by the persons who handle them. Impatience with the timid

FARM DAIRYING

heifer often results in a kicker. The best device, perhaps, for a kicker, is to put a ring in the ceiling overhead and with a halter on the cow draw her head up pretty taut when milking her. She cannot very well kick in this position, and seemingly does not know the reason why. Other methods are to tie the hind legs together, or to draw the right-hand hind leg slightly back with a rope attached to the wall or a post. This leg rope is much used in New Zealand.

CUT OFF THE SWITCH

When the fly time is past, it is well to cut off the switch just below the tail-bone; also to shear the hind quarters with a pair of horse clippers and trim the long hairs from the udder. It will be much easier to keep the cows clean in the stable if this be attended to.

CHAPTER XXI

MILKING MACHINES

The outraged cow went forth and joined
The herd among the greenery:
"What d'ye think they did just now?
They milked me by machinery!"

—*The Khan.*

THE ingenuity of man is such that the day will shortly come when there will be a milking machine that will do the work effectively, preserve the quality of the milk, and not be too complicated or expensive. Any machines we have seen tried have not proved entirely successful. It seemed impossible to keep the tubing perfectly clean, and the milk became contaminated. There was more or less trouble in the management of the machines. As for their milking qualities, heifers not accustomed to hand milking apparently did equally well when milked by a machine. The old cows decreased in their milk-flow, and some objected to the method and would not let down their milk at all.

When the machine is perfected it will be the ideal way of taking the milk; when passing through tubes into the covered pails the milk escapes contact with unclean hands and atmospheric im-

FARM DAIRYING

purities. It will be getting closer to Nature's way. The calf, when allowed to go with the cow, drinks the purest of milk — direct from the producer to the consumer.

The principle is much the same in nearly all milking machines.

There are four bell-shaped cups in which the teats are placed. A tube from these connects with a covered pail, and to the pail is attached another tube connected with a vacuum pump. As the air is drawn from the pail by the pump, the suction causes the rubber cups to press or squeeze the teats, and this pressure forces the milk from them. Then as air is admitted, the cups relax a little and the milk flows from the udder into the teats. A glass fixture on the pail-lid shows when the milk has ceased coming. Heavy milkers are afterwards stripped by hand. Where herds of fifty or more cows are kept, the milking machine is fast growing in favor, especially as it becomes harder each year to secure good milkers.

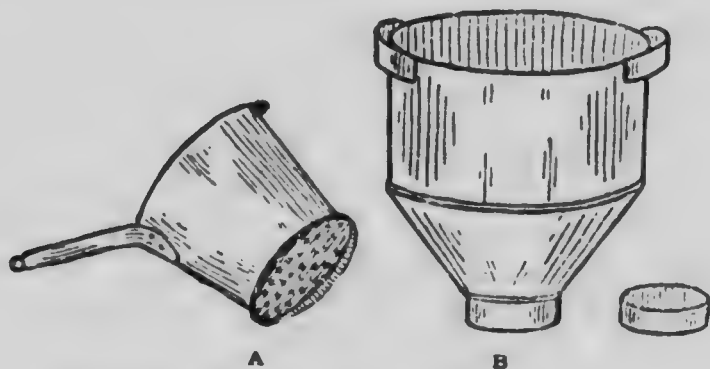
I may not be sanguine enough, but to me the human hand, with its firm, yet gentle, sympathetic, adaptable touch, will ever remain the best and most reliable milking machine.

CHAPTER XXII

STRAINING THE MILK

TO keep the dirt out, not to strain it out, is the aim of the cleanly dairyman.

Milk should never be left standing in the stable or in the kitchen. It is the unseen, dissolved dirt that is alarming and that does the damage. Every hair, straw, fly, and particle of dust, is laden with



A. STRAINER DIPPER WITH SANITARY HANDLE. B. MILK STRAINER WITH HOOP FOR HOLDING CHEESE-CLOTH IN POSITION.

bacteria. When these get into the milk, the bacteria are washed off and we are able only to strain out the visible and least harmful part. The sooner these bacteria-carrying agents are removed the

FARM DAIRYING

purser will be the milk and the better its keeping qualities. Therefore, strain the milk immediately.

I would not have the strainer on the pail. Several thicknesses of five-cent cheesecloth make an excellent strainer. If a separator is used, fold the cloth and spread it over the receiving pan, fastening it in place with clothes-pins. If deep creamer cans are used, place the cloth in a similar manner on the top of them. If large milk cans are used, it may be necessary to have a tin, like the illustration, with a loose-fitting hoop to slip over the cloth to hold it in position.

Wire strainers are little used. They do not prevent hairs and fine dust from getting through.

The strainer cloth should receive special attention. It must not be plunged into hot water. This cooks the albumen of the milk and the cloth becomes stiff and unsanitary. The cloth should first be rinsed in tepid or cold water to get out the milk, then washed in warm water with some washing compound such as soda in it, and scalded well in clear water and hung outside to air and dry. It is a good plan to boil it frequently.

CHAPTER XXIII

MILK FOR THE CHEESE FACTORY

WHILE it is necessary for the patron supplying milk or cream for butter-making purposes to send a first-class quality, a still greater responsibility rests on the patron of the cheese factory. For butter-making, pasteurization may be and is resorted to, to check objectionable bacterial growth and drive off food flavors; but this is impossible in cheese-making. The cheese-making process is one which lends itself to the multiplication of evils, if they have already a beginning in the milk. A can of bad milk will spoil all that of fifty other patrons, lower the price of the cheese, and injure the reputation of the maker.

Special provision should be made on the farm for quickly cooling the milk to 65°, or lower, and keeping it at that temperature over-night, and for lowering it to 50°, and sustaining that temperature when it is held over Sunday. Depend on nothing but a correct thermometer for ascertaining temperatures. Ice is almost a necessity in order to care properly for Saturday night's and Sunday's milk.

Milk intended for cheese-making should not

FARM DAIRYING

have over .20 per cent of acid when delivered at the factory. It usually does not smell or taste sour until it contains from .30 to .35 per cent, and then it is quite unfit for cheese-making purposes. Our senses of taste and smell are not accurate enough to determine the exact stage of acidity. The cheese-maker uses the acidimeter, and we

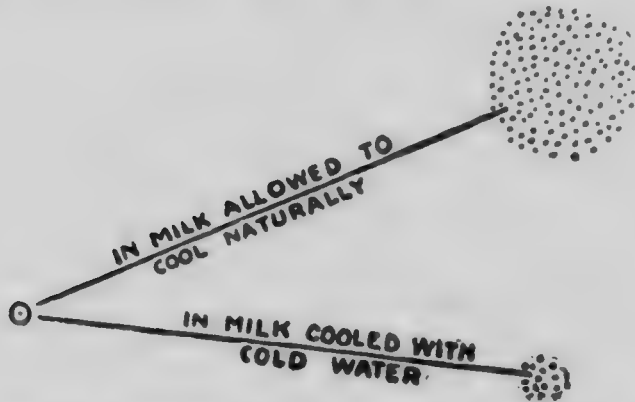


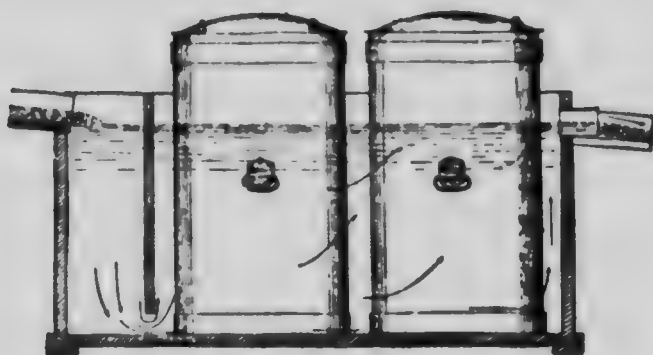
CHART SHOWING THE MULTIPLICATION OF A SINGLE GERM, CLEARLY INDICATING THE NECESSITY OF QUICK COOLING

should abide by his decision and not be offended if the milk be returned, but make an extra effort to keep it in better condition.

The dairy farm should have a milk-house. It may be built of wood or of cement. In it should be a tank large and deep enough to hold cans containing at least two milkings and a six-inch

FARM DAIRYING

space around them for water. There should be an outlet pipe near the top to allow the water, as it becomes warm, to be carried away, in order to keep down the temperature of the milk. An outlet at the bottom is necessary, that the tank may occasionally be emptied and cleaned.



TANK FOR COOLING MILK IN CANS

If there is a windmill at the well, a large tank should be provided, and from it piping should be laid to supply the smaller tank with water. If there is no windmill, the milk-house should be built near the well. Be sure to make a proper drain to carry away the surplus water. Endeavor to keep the farm buildings and yards dry and tidy.

A windlass is convenient to raise and lower the cans into the tank. Also have some contrivance to do the lifting at the milk-stand. Have a track

FARM DAIRYING

laid from the milk-house to the stand, and a car or truck for carrying the cans. If farmers would have a few of these little and easy-to-get conveniences, the drudgery of the milk business would be greatly lessened.



HOIST FOR LIFTING MILK CANS
IN COMMON USE AT FACTORY WEIGH-STANDS

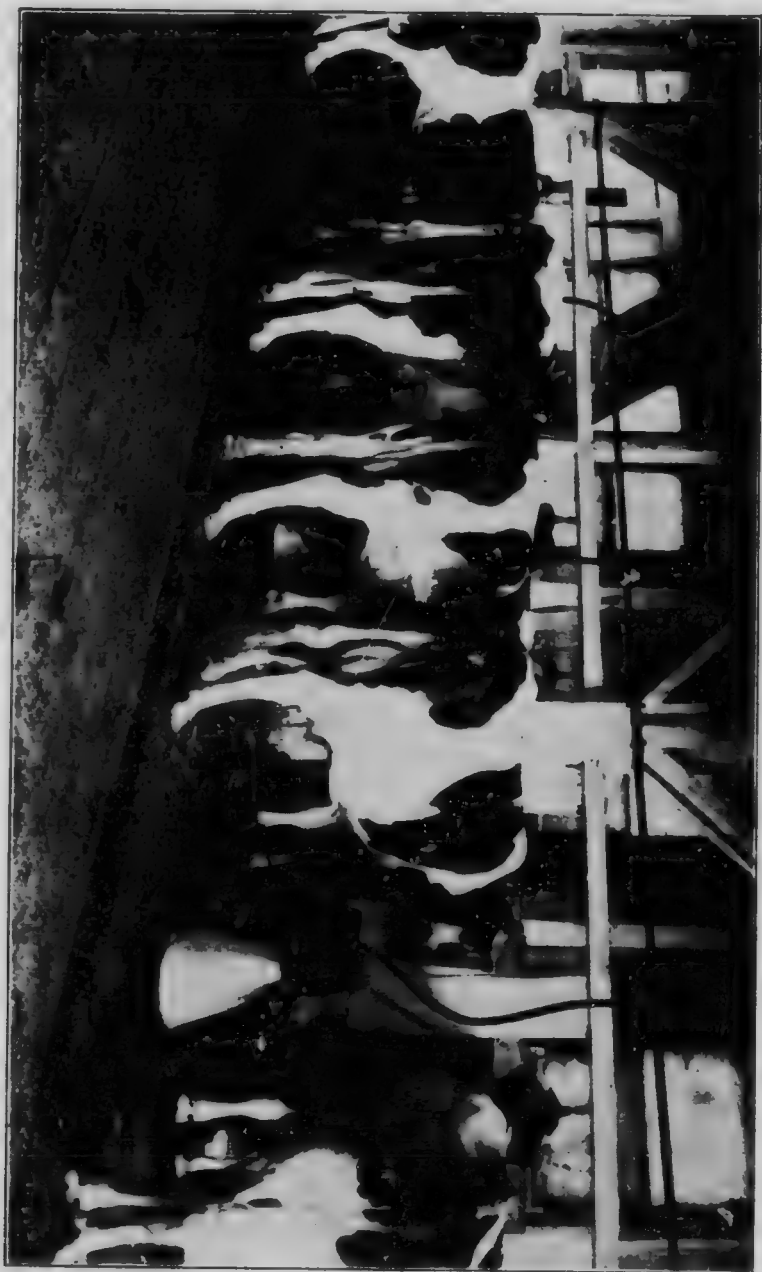
FARM DAIRYING

Warm milk should not be mixed with that already cooled, if it can be avoided. If at all possible, it should be sent in separate cans. If it be necessary to mix night's and morning's milk, the best plan is to cool the morning's milk also. If there be not time to do this, the evening's milk should be cooled to at least 60 degrees. It is quite possible to have excellent milk delivered by this last method, where cleanliness is observed, and the night's milk well cooled.

The aeration of milk is something that is not recommended to be generally practised. Practical experiments have revealed the fact that exposing the milk to the air by dipping, pouring, or running it over an aerator, even in apparently good surroundings, increases the number of undesirable bacteria, and is one of the causes of gassy curds.

Cooling the milk immediately after or during milking, with as little exposure to the air as possible, and putting the lids on the cans, is recommended by our Chief of the Dairy Division.

Where ice or cold water cannot be obtained or where a can of milk has to be left in a place where water and ice cannot be conveniently used, a wet cloth — preferably flannel — wrapped around the can is an aid in keeping the milk cool. It is best



MILKING COWS BY MACHINERY

FARM DAIRYING

to have one end of the cloth immersed in a pail of water. A large amount of the sun's rays falling on the wet cloth is consumed in evaporating moisture and is thus prevented from reaching and heating the milk.

Under no conditions should chemicals be used for preserving the milk. They completely upset the process of cheese-making.

Whey should not be returned in the cans, unless it has been heated to 155 degrees in the factory tanks.

The cans, going to and from the factory, should be covered with canvas to keep out the dust and heat. Needless to say the cans must be well washed and scalded. They should not be put under trees or in a bad-smelling place. Have a bench or stand in a sunny, clean place, on which the cans may be inverted to drain and sun and air. Rusty cans are the cause of much trouble and should never be used. Painting the cans on the outside greatly aids in their preservation.

Remember, the better the milk is cared for on the farm, the less milk it takes at the factory to make a pound of cheese, and superior will be the quality of the cheese.

CHAPTER XXIV

CREAMING MILK

MILK is composed of fat, solids-not-fat, and water. The solids-not-fat and the water are the skim-milk, or milk serum. The fat, which is the lightest constituent, rises to the surface when milk is left undisturbed. There is always more or less milk serum with the fat, and the two, so mingled, constitute cream.

A vessel which would hold 1,000 pounds of water would hold approximately 1,032 pounds of whole milk, 1,038 pounds of skim-milk, 1,000 pounds of average cream, or 936 pounds of milk-fat.

There are conditions which facilitate the creaming of milk: The larger the fat globules the more readily they separate from the milk serum; the less viscous or sticky the milk, and the lower the percentage of solids-not-fat, the less resistance to the fat globules in passing through the milk; the sooner after being drawn, and the longer the milk is subjected to the creaming force, the more complete will be the separation of the fat.

There are two general methods of obtaining cream from milk—the gravity system, making

FARM DAIRYING

use of the shallow pan or the deep can; and the centrifugal system, employing the cream separator.

Shallow Pan: This method is the oldest, and is now little used. Where only one or two cows are kept; where ice cannot be secured, or the supply has become exhausted for the deep setting method; or where the separator is out of order, pans may be used.

Where the creaming is carefully done, the skim-milk from pans will not contain over .3% butter fat, but usually it tests much higher. The cream may contain from 15% to 40% fat.

Many farmhouses have no suitable room in which to set milk. It is often put in a cellar which is close and musty and serves as a storage place for roots, fruit, etc., or is kept in the pantry off the kitchen, and comes in contact with all kinds of cooking odors, which it readily absorbs.

Pans should be set in a clean, well-ventilated room where the temperature ranges from 50° to 60°.

Avoid having the milk close to the wall or in a strong draught, so as not to have a leathery coat form, due to rapid evaporation.

The pans are better covered with heavy clean paper, if possible, after the milk has cooled.

The milk should stand from twenty-four to

FARM DAIRYING

forty-eight hours before being skimmed, but should not be coagulated.

To skim, loosen the cream from the sides of the pan with a thin-bladed knife. Lift the pan to the edge of the cream can, tilt it to allow a little of the skim-milk to wet the edge of the pan, then with the aid of the knife, quickly glide the sheet of cream into the cream can. Do not use the old-fashioned perforated skimmer. It is wasteful of cream. Be careful not to take any more skim-milk with the cream than cannot be avoided.

This system has many disadvantages: a great surface of the milk exposed to atmospheric contamination; the milk liable to become too acid for domestic and feeding purposes; the cream clotted and over-ripe; the creaming incomplete; a large space necessary for the pans, and much labor involved.

Deep Cans: A water-tight box or barrel for holding the deep cans will do as effective work as an expensive cabinet creamer, but there should be room for plenty of ice. It is economy to have ice always in the water, and just as necessary to use it in winter as in summer. To do good creaming, the water should not be above 45° in summer, and it is better to have it still lower in winter. To maintain this temperature it is necessary to put in

FARM DAIRYING

a good supply of ice, unless one is fortunate in having a very cold running spring handy.

The warm milk should be immediately strained into the cans, and the cans lowered into the water, which should reach as far up as the milk.

The cans usually are eighteen to twenty inches high and eight inches in diameter. We prefer a slant-bottom can, with a tap to draw off the milk. The slant carries away any sediment and permits the removal of all the skim-milk.

Cans without a tap — called the shotgun cans — should be skimmed with a funnel-shaped dipper, having a long, straight handle, and no wire around the rim. It is best to loosen the cream from the sides of the can with a knife, then wet the dipper in milk or water and lower it point first into the can, allowing the cream to flow evenly into the dipper. Repeat until all the cream is removed, being careful not to take too much skim-milk with it.

Milk should always set twenty-four hours before the skim-milk is drawn, and thirty-six hours in winter is better. Milk allowed to stand only twelve hours



FUNNEL
SHAPED
SKIMMER

FARM DAIRYING

before skimming will yield a larger volume of cream, but it will test low, — from 15% to 20%, — while the skim-milk may test as high as from .6% to 1% and over, especially if the water has not been cold. In twelve hours the smallest of the fat globules have not had time to rise to the top and so pass off in the skim-milk and become, like the prodigal son of old, feeders of swine. When the milk is allowed to stand twenty-four hours the cream will test from 18% to 25% and the skim-milk from .2% to .4% ; or in other words, we have in the case of the longer setting a richer cream, and less loss of fat in the skim-milk — two desirable results in creaming milk.

Butter made from cream from the deep setting system is usually of good quality as the cream is always at a low temperature, which is unfavorable for the development of bad flavors.

The disadvantages are: the heavy lifting of the cans, the storing and handling of ice, and the heating of the skim-milk for the young stock.

THE DILUTION OR HYDROLACTIC METHOD

Many devices have been put on the market for creaming milk by adding a certain percentage of cold water to the warm milk, usually 100%. We have tried a number, and recommend none.

FARM DAIRYING

There is great danger of spoiling the cream by using impure water. It robs the cream of its flavor, giving it a flat taste. The loss of fat is greater than by the other gravity methods. The skim-milk is much diluted for household or feeding purposes.

The only time water may be advantageously added to milk is when the cows have been a long time in milk and the milk is viscous, and rich in solids. Then a small amount of hot water will help. If the milk has a strong food flavor—such as turnips give—a pint of boiling water put in the shallow pan, as the milk is strained in, helps to some extent to drive off the flavor.

CHAPTER XXV

SEPARATORS

THE invention of the cream separator gave a great impetus to the butter industry and revolutionized the handling of milk and cream. It was only after many crude and frequently unsatisfactory attempts that our present efficient separator was evolved. The first machine had buckets or pails suspended on a wheel in such a manner that, when set in motion, they flew around in a circle. The principle made use of at that time was precisely the same as that used by our present-day inventors. One of Nature's laws is, that which is heaviest, when set in motion, flies farthest from the centre of motion. We have, in milk, the heavier skim-milk and lighter cream, therefore, when milk is subjected to a strong centrifugal force created by the fast rotating separator bowl, the skim-milk is thrown as far from the centre as it can get and forces the cream as near the centre as possible.

The machine is so constructed that the cream escapes from an outlet near the centre of the bowl, and the skim-milk is drawn from the inside wall

FARM DAIRYING

of the bowl, where the force is greatest and the separation most complete.

Nearly all makes of machines have a more or less complicated skimming device, in order to divide the milk into thin sheets, and so afford less resistance in the separation of the cream.

Many ask the question, "Which is the best make of separator?" All the standard makes have good points, and the question sifts down to a matter of small details, which appeal differently to different people. In buying a separator, select a good skimmer, one that turns easily, is well made of good wearing material, not too complicated in construction, easy to clean, convenient as to height of cream and skim-milk spouts, and sufficiently large for the size of the herd.

It must be remembered there is a vast difference between machines of the same make; and a purchaser should satisfy himself that his machine is a clean skimmer and a smooth, easy runner, before closing the bargain. Buying from an established reliable firm has advantages, and is to be recommended.

The machine should not be set up in a stable. Occasionally one sees a separator in an empty cow stall. This is bad. It is convenient to have a small room fitted up for the machine, near to or in



MICROCOPY RESOLUTION TEST CHART

ANSI and ISO TEST CHART No. 2



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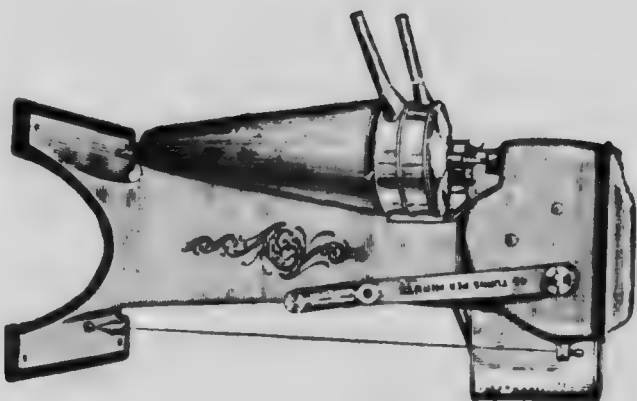
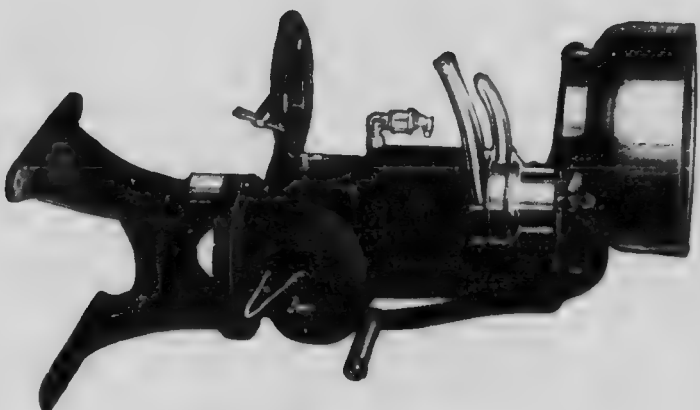
FARM DAIRYING

the stable. Such a room should be well ventilated and clean, and the floor tight.

The foundation of the separator should be firm. Even a slight vibration injures such a finely constructed piece of machinery. For the same reason, the machine should stand perfectly level. A small piece of quarter-inch rubber packing, placed under the legs before fastening, improves the running of any separator. Keep all parts clean. Every week or two run a little kerosene through the oil channels to remove the black grease and accumulated dirt from the bearings, but do not fail to oil the machine well afterwards. Coal oil is not a lubricant, simply a cleanser. Use only the oil furnished for the machine, or one of equally fine quality.

When starting the machine, get up speed gradually. Put the same pressure on the handle during the entire circle of it, and sustain an even speed. For close skimming, run the machine a few turns above the tabulated speed rather than below. Slow speed is the cause of much poor skimming.

Before turning on the milk, put enough hot water through the machine to wet and warm the bowl thoroughly. This insures cleaner skimming and prevents the cream from sticking to the skim-



TYPES OF CREAM SEPARATORS: SIMPLEX AND TUBULAR

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ming device. Do not allow the milk to get too low in the receiving can, or the cream outlet may clog. The inflow of milk into the bowl should be steady and should be approximate to the capacity of the machine. If for any reason the machine has to be left before the run is finished, shut off the flow of milk, and if convenient flush out the bowl with a little warm water to prevent the cream outlet from clogging. At the end of the run enough warm water should be put through the bowl to force the cream out. This water must be pure, for some of it of necessity gets into the cream; but allow only what is necessary to flush the cream from the bowl. Too hot water will scald the milk on the bowl and make it hard to clean. Skim-milk may be used for flushing out the bowl, but warm water is better.

Milk should always be strained before separating. The sooner the dirt is removed the better; moreover, hairs, small pieces of straw, etc., are apt to close the outlets. Putting two thicknesses of cheesecloth over the receiving can and holding them in place with several clothes-pins is a convenient method.

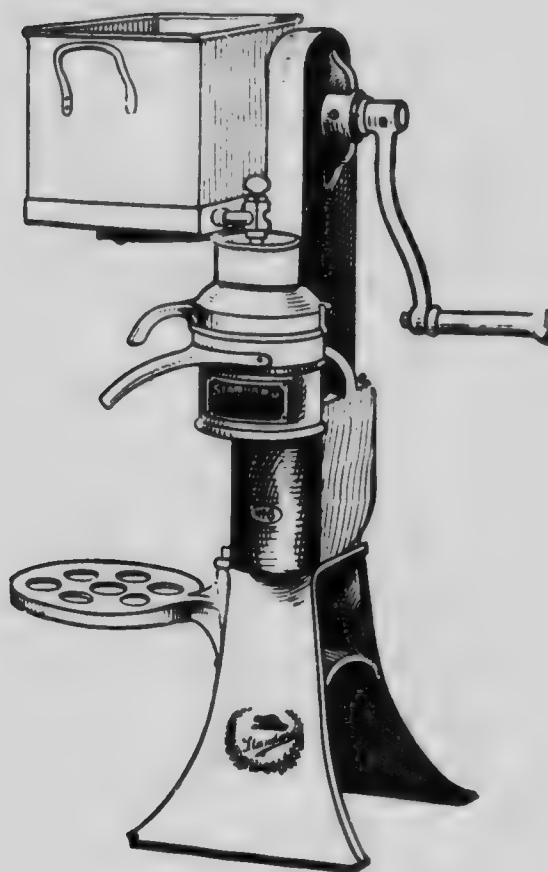
Milk is at its best for separating immediately after being drawn from the cows. Should it cool below 85 degrees it is better to warm it, although

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some machines do good skimming at a lower temperature, but there is always a risk of losing cream when the temperature of the milk is low.

Should the milk supply become so small that it seems hardly worth while starting up the machine, the night's milk may be held till the morning; but, to preserve the quality, it should be quickly cooled, as soon as milked. This held-over milk should have the cream well stirred in and be heated to 100 degrees or over; for no harm, but really good, results from having the milk hot. Run it through after the morning's milk has been separated. This practice has its disadvantages. The extra handling of the milk tends to an extra loss of the fat, and the quality of the cream may suffer. It is to be recommended only in case of a very small supply.

There is one point that must be emphasized. *The machine must be thoroughly cleaned after each time of using.* First, rinse the parts which have come in contact with the milk in lukewarm water. Then wash in hot water in which some washing powder has been dissolved. Use the brushes provided by the manufacturers to clean the different parts. Rinse in scalding water, and place on a rack to drain and dry. Never use a drying cloth, the hot water should be sufficient.



CREAM SEPARATOR: STANDARD



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Do not subject the rubber ring to too hot water. Heat ruins rubber.

The separator brushes should be frequently scalded in a strong soda solution to keep them sweet. Have a square of cloth to throw over the frame of the machine after it has been wiped. This prevents dust getting in the bearings.

Study your machine. Become familiar with the sound it makes when running properly, then you will be able to tell when it is out of order.

A machine should not leave over .05 per cent fat in the skim-milk when properly managed. When the loss exceeds this, it is time to look for a cause. Real good skimming does not leave over .02 per cent.

It is a good plan occasionally to make a test of both the skim-milk and the cream. The fact that no cream rises on the skim-milk over night is no sign that a separator is doing good work. When making butter on the farm in the barrel churn, I would have the cream test from 24 to 28 per cent fat; but if it is to be sent to the creamery, have it from 30 to 35 per cent. It is our duty to help the creamery man all we possibly can. By sending him a rich cream we do much toward making the butter a better quality. Most of the

FARM DAIRYING

separators, if rightly run, will skim a 30 to 35 per cent cream, and do good work.

In another chapter the care of separator cream is taken up, but let me mention here the necessity of quickly cooling it immediately after it is separated.

Where eight or ten cows are kept, get a machine with a capacity not less than 500 pounds per hour. All machines, except the smaller sizes, are so constructed that they may be connected with power. The most common power in use is tread-power. A small gasoline engine is gaining favor for this purpose and is a great help in many ways in lessening labor on the farm; namely, churning cream, washing clothes, running a vacuum cleaner, sawing wood, chopping grain, pulping roots, etc.

SEPARATOR TROUBLES

The most frequent disorder of a separator is the vibrating of the bowl. This may be caused by:

1. The machine not being level.
2. The machine not firmly fastened, or the foundation not solid.
3. Neck bearing too loose, or too tight.
4. Bearing out of line with worm gear spindle.



CREAM SEPARATOR: DE LAVAL

FARM DAIRYING

5. Bowl out of balance.
6. Spindle of bowl bent or injured by careless handling.

When the bowl leaks milk, the parts are not properly put together, or the rubber ring has been forgotten or is injured.

The greatest cause of incomplete skimming is low speed. The separator bowl revolves at a speed of from six thousand to fifteen thousand times a minute, and a pressure equal to fifteen tons to the square inch is exerted on the milk. This is at full speed. When the speed falls but a few revolutions below the tabulated turns per minute, the force on the milk is greatly lessened, and more fat is left in the cream.

CAUSES FOR VARIATIONS IN CREAM TEST

Many people who sell cream cannot understand why their cream should vary so much in the per cent of fat, and are dissatisfied and grow suspicious that the testing is not properly done. There are many reasons why the fat content of cream may vary. They are:

1. Speed of the bowl. Slow turning gives a cream of low test, and a greater loss of fat in the skim-milk.
2. Amount of water or skim-milk used to

FARM DAIRYING

flush the bowl in proportion to the amount of cream.

3. Amount of milk in the supply can: the less milk, the richer the cream.

4. Partial closing of the faucet of the supply can.

5. Clogging or imperfect cleaning of the cream and skim-milk outlets.

6. Temperature of the milk when separated.

7. Variations in the per cent of fat in the milk separated: the richer the milk in fat, the richer the cream.

Very often when the cows freshen in the spring, and when the grass stimulates the milk-flow, no change is made in the adjustment of the cream screw. Usually, the fresher the cows in milk and the heavier the flow, the lower the percentage of fat; and so the necessity for turning in the screw, so as to have less skim-milk in the cream.

CHAPTER XXVI

BACTERIA IN RELATION TO THE DAIRY

“O powerful bacillus,
With wonder how you fill us,
Every day!
While medical detectives,
With powerful objectives
Watch your play.”

BACTERIA play such an important part in milk and its products that we must know something of the life history of these minute organisms to be able to recognize and guard our friends, and wage death to our enemies, for we have both in their ranks.

Bacteria belong to the vegetable kingdom, being single-celled plants, infinitely small, and visible only with a powerful microscope. When grouped together in what are called colonies, they may be seen with the naked eye. A spot of mould on sour milk may be likened to a colony developed from one germ.

To give an idea of their size: it takes about nine hundred thousand to measure an inch, and five billions may be in a teaspoon of sour milk, and still there may be room for more.

Nature uses bacteria to keep the working mate-

FARM DAIRYING

rial of the universe in circulation. When meat, milk, wood, etc., decay, it is largely the work of bacteria reducing them to gases, and dust, that these elements may again be built up into plants and trees for the use of animals. If it were not for bacteria, this world would soon become uninhabitable.

Bacteria have three general forms — spherical, rod-shaped, and spiral. Their method of increasing is simply by dividing, one germ becoming two. This is the distinguishing mark which separates



DIFFERENT TYPES OF BACTERIA

MAGNIFIED 1,000 TIMES

bacteria from yeasts. The latter multiply by budding — the buds breaking off and forming new plants.

FARM DAIRYING

So potent is the power of reproduction that one germ may become two in half an hour, and the progeny from just one bacterium may number

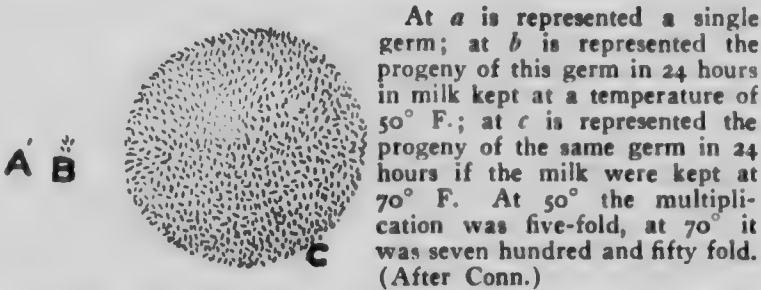


DIAGRAM SHOWING THE EFFECT OF TEMPERATURE ON
THE KEEPING OF MILK

over sixteen million, five hundred thousand in twenty-four hours. However, they do not go on increasing forever at such a rapid rate; the food supply gives out, or they cannot thrive in an excess of their own by-products — lactic acid, for example.

Sometimes spores develop inside the germ cell and these have wonderful power of resistance against heat, some surviving even the boiling point, and many other adverse conditions. Freezing does not destroy bacteria.

Three things are necessary for bacterial growth — food, moisture, heat. An absence of any one of these renders the germs dormant. We cannot

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well withhold food, but we expel moisture from meat, fruit, etc., to preserve them. We cool milk and place perishable foods in refrigerators for no other reason than to hold in check the bacterial growth, and so retard the souring or decomposing process.

The most favorable temperature for bacterial growth is between 80 and 100 degrees. The air in caring for milk should be to lower the temperature quickly and keep it low, if the desire is to have the milk remain sweet. At a temperature below 50 degrees, bacterial growth is practically at a standstill. A temperature of 160 degrees kills most of them if it be maintained for twenty minutes. Instantaneously heating to 185 degrees destroys all but a few of the resistant spore formations.

Some three thousand different species of bacteria have been identified. Most of them are helpful agents in the world's economy. Some are undesirable, but not dangerous. Others are harmful and cause death when not checked.

So many of these disease-producing germs find a perfect medium for their development in milk that too much care cannot be exercised to keep the milk pure. When any contagious disease breaks out in a family, those who are recovering



ONE HAIR FROM A COW, PLANTED IN NU -
TRIENT JELLY

THE WHITE SPOTS ARE COLONIES OF BACTERIA, AND
EACH COLONY IS THE PROGENY OF A SINGLE GERM ON
THE HAIR.



FARM DAIRYING

or who wait on the patients should never milk the cows or care for the milk. If they do, the natural result will be an outbreak of the disease.

We know that many of the cows in the country are, to a more or less degree, affected with tuberculosis. The milk from such cows should be pasteurized even for the calves and pigs, or the disease will spread, especially if it is located in the cows' udders. The tuberculous animals should be isolated from the herd. As the disease is not hereditary, healthy calves may be got from such cows, but the calves must never have their mothers' raw milk. The study of bacteriology has revealed these and many other truths to us.

The bacteria which are of greatest aid to the dairyman, and native to and most largely found in milk, are the lactic acid germs. A pure culture of these germs is used in butter and cheese making, and gives the fine flavor and aroma so much desired in these milk products.

We have others which cause us trouble. There are bacteria which turn milk blue, red, and occasionally yellow. Others produce a curdling of the milk without souring. Some produce gas accompanied by bad flavors; these latter cause much trouble to cheese-makers. Some make the milk very bitter, others give it a soapy taste, a fruity

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taste, or a strong barnyard odor, and some make the milk slimy or ropy, so that it can be drawn out into long threads.

Trouble from any of these is usually the result of carelessness or unsanitary conditions. The main precaution is to keep the entire surroundings, cows, milk pails, separator, etc., just as clean as possible. These germs get into the milk at the time it is drawn from the cows, or afterwards. Milk in the udder is practically germ-free. It is our duty to war against the entrance of bacteria to milk.

We need have no fear of bacteria in milk if we practise cleanliness and use the two safest and best means to check their growth — *extreme heat and cold*.

CHAPTER XXVII

PASTEURIZATION OF CREAM

PASTEURIZATION has become justly popular. In Denmark, the great dairy country, over ninety-five per cent of all cream for butter-making is pasteurized.

Pasteurization, while not removing all the ills which are apt to befall cream, to a great extent —

1. Drives off bad odors, especially those due to feed.
2. Destroys most of the bacteria, leaving a clean seedbed for the added culture to work in.
3. Produces uniformity of flavor from day to day.
4. Makes the cream easier to churn.
5. Adds to the keeping qualities of the cream and butter.

For creamery work the practice cannot be too highly recommended.

On the farm, where conditions are under one's special supervision and control, it is not necessary to pasteurize, nor do we advocate it. If from some unusual cause the cream is off in flavor, or difficult to churn, or the butter is to be packed and

FARM DAIRYING

held for some time, then pasteurizing is the proper thing to do.

Cream that is sour may be pasteurized, but it must be quickly heated and constantly stirred. To attempt to heat poor cream, just on the point of coagulating, turns it into a ropy or curdy mass.

To pasteurize cream, place the can containing it in a vessel of hot water. Stir the cream occasionally and bring it to a temperature of 175° . Authorities give a range of temperatures from 160° to 185° . Leave it covered at that temperature for twenty minutes. It will cool very little if just lifted out of the water. Then rapidly cool to 60° or below.

Pasteurized cream remains sweet for several days. A culture must be added to it if ripened cream is desired for churning.

To sterilize cream or milk, heat it to 212° , the boiling point. This temperature is supposed to make it germ free. Sterilized milk is not so digestible as raw milk, or pasteurized milk.

CHAPTER XXVIII

CREAM FOR CREAM GATHERED CREAMERIES

THE hand separator is in such general use, that the cream, instead of the whole milk, is now largely delivered at the creameries.

If a reputation for good butter is to be established and maintained, it is the farmer who has to do it, for he has the controlling factor now in his hands. If the cream reaches the creamery in good condition, the butter-maker's task, as far as concerns the making of good butter, is easy. There are exceptions, but our makers are usually qualified and competent. The very gods themselves could not make No. 1 butter from fermented, tainted cream.

Have the cream sweet and delicate in flavor. Avoid feeds that will taint the milk. Do not feed turnip tops or rape. Do not imagine turnips can be eaten by the cows, even after milking, and not affect the quality of the butter. Turnips have their place, but it is not on the menu of a milking cow.

Milk from freshly calved cows should not be skimmed until after the eighth milking.

Put up ice, and study the problem of keeping

FARM DAIRYING

the cream cold. The temperature must be kept low : 50 degrees or under in summer, and the cream quickly cooled after separating, in winter as well as in summer. Each skimming of cream should be cooled before mixing with that already cooled. If water is scarce for cooling purposes, the cream may be put in shallow pans and set in a cool, clean cellar on a stone or cement floor. The stone and cement are good conductors of heat, and soon reduce the temperature by drawing the heat from the cream.

It is best to have the cream delivered at the creamery every day in summer, or at least three times a week, and not less than twice weekly in winter.

The farmer's aim should be to send cream testing from 30 to 35 per cent fat. There are many reasons why cream of high fat content should be sent :

1. It means more skim-milk left on the farm.
2. Less weight of cream to haul.
3. Less danger of souring.
4. Less loss of fat in the manufacture.
5. The maker has better control over the quality of the butter; hence a better price, and more money for the farmers.
6. By sending cream sweet, a more accurate

THE EVENING MEAL



FARM DAIRYING

and frequently higher test is obtained, than when the cream is sour and lumpy.

THE OVERRUN

When cream is taken to a creamery there is usually quite a little talk about the "overrun," and frequently the term is not understood.

The overrun consists of the pounds of butter made over the pounds of fat in the milk or cream. This difference between the fat and the butter is made up of water, salt, and casein or curd, and varies under different conditions. Exhaustive churning, carefulness regarding waste, skill in incorporating moisture (the law prohibits more than 16% water), are factors which tend toward a large overrun.

Under good conditions, 85 pounds of fat will make 100 pounds of butter. It is easy to find the percentage of overrun.

If 85 lbs. fat make 100 lbs. butter

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Percentage of overrun is $117.6 - 100 = 17.6$.

The average overrun is about 15%, but many creameries do better than that.

CHAPTER XXIX

CULTURE OR STARTER FOR RIPENING CREAM

FOR farm butter-making, unless carried on extensively, I do not think it necessary constantly to make and use a skim-milk culture. It entails much work and care. Sour cream of good flavor answers in its stead. It is, however, well to know what a culture is, and how to prepare it. A pure culture for the dairy is a propagation of lactic acid germs in a medium preferably of pasteurized skim-milk. Its use is:

1. To develop the desired flavor in cream for butter-making.
2. To keep the flavor uniform.
3. To have the ripening process regarding length of time and percentage of acidity, under one's control.

In propagating a culture it is advisable to start with a commercial pure culture. These are put up, either in liquid or powder form, in small bottles. Many of the bacteriological departments of agricultural colleges supply cultures at a nominal cost.

The first culture is called a mother culture. The

FARM DAIRYING

powder or liquid is emptied into a quart of pasteurized skim-milk and allowed to stand at a temperature of 75° until coagulated. The can in which the culture is made, and the stirring-ladle, must always be sterilized otherwise the culture would soon become seeded with foreign germs. The can must be kept covered. The first two or three propagations may not have the desired flavor, as it takes time for it to develop from the commercial culture.

In the ordinary making of a culture from time to time, select good-flavored skim-milk, heat it to a temperature of 185° , stirring it occasionally. Allow it to stand at that temperature for twenty minutes or longer, then quickly cool to a temperature of from 60° to 70° , according to conditions. To this prepared milk add from one-half to two per cent of the culture on hand; the amount should depend on the vigor of the germs, the constancy of the temperature, and the length of time before the culture is required to be used.

Before using, remove an inch or two from the surface to guard against contamination from outside sources. Break up the remainder by stirring it well, and fill a small sterilized glass jar for propagating the next culture. With care, a culture may be propagated almost indefinitely. The

FARM DAIRYING

one we use at the Ontario Agricultural College dairy has been in constant daily use nearly ten years. A good culture should be firmly coagulated, with no liquid on top; be smooth and free from lumps when broken up, and have the smell, and the clean, mild acid flavor peculiar to good sour milk. It should have from .6 to .7 per cent lactic acid.

A good mother culture may be made by filling a sterilized glass jar with the purest of milk possible, from a cow not very long milking. Cover the jar with several thicknesses of cheesecloth and keep at a temperature of about 70°. When coagulated, skim off the top, and if the remainder has the same properties as those just ascribed to a good culture, it may be used in ripening the cream. This is a good way to do, when from any cause the cream has gone off flavor and is no longer safe for use as a culture.

CHAPTER XXX

DAIRY-ROOM AND CHURN

ON our American farms not enough attention is paid to having a proper dairy-room. Butter is too often made in an overheated, poorly ventilated kitchen. If possible, a building, or at least a room, should be fitted up and used exclusively for dairy work. It should be well lighted, well ventilated, convenient, and easy to keep clean. It should be well supplied with pure, cold water, and should have a good drain. One great trouble around our farm homes is a lack of proper sewerage system, causing very unsanitary conditions. This menace to the senses and health may be overcome by installing a septic tank and filter bed at a cost of about \$50.00. An up-to-date hardware merchant can tell where to secure the necessary equipment and how to put it in.

Provision should be made for heating the dairy in winter, and, by choice of location and shade trees, having it as cool as possible in summer.

I have used many different kinds of churns, but so far have found none so satisfactory as the plain barrel style, revolving end over end and having no dashers or breakers inside. The earth-

FARM DAIRYING

enware revolving churns have much to recommend them in being so easily kept clean, and are becoming quite popular.

In buying a churn be sure to get a large size. If more than two cows are kept, buy nothing smaller



BARREL CHURN

than size No. 3. It has a churning capacity of from two to seven gallons, though I prefer not putting over five in it. Multiply the usual number of gallons of cream you have by three, and it will

FARM DAIRYING

give you the capacity of the churn you should get. To do good work it is best to have the churn only one-third full.

Get a churn with a strong stand and the upright bars well braced. It should be convenient to get a pail under to draw off the buttermilk, etc. The plug hole should be as nearly level with the bottom of the churn as possible. The lid should be large, the fastenings convenient and safe, and the sight-glass in the lid large.

There should be two means of making the churn revolve, or rather it should be so that two persons may work at it together. I have a preference for the overhand bar. Some like the crank and foot-gear. Even though most of the churns run on ball bearings, a satisfactory method to make churning easy is yet to be invented. Where much cream is made into butter on the farm, some power other than human muscle should be contrived and a combined churn and worker used. Endeavor to have proper dairy utensils, time and strength will be saved and more pleasure taken in doing the work.

FARM DAIRYING

FARM DAIRY EQUIPMENT FOR FROM FOUR TO EIGHT COWS

Prices will vary in different localities, and
according to quality.

1	No. 3 barrel churn	.	.	\$ 7.00
1	Floating thermometer	.	.	.25
1	Lever butter-worker	.	.	4.50
2	Butter ladles or spades	.	.	.30
1	Butter printer for pound prints	25c to	2.50	
1	Large strainer dipper	.	.	.40
1	Large plain dipper	.	.	.25
1	Long-handled dairy brush	.	.	.15
1	Small fibre brush	.	.	.20
1	Five-gallon covered cream can	.	.	.75
1	Shotgun can	.	.	.60
1	Cream stirrer or ladle	.	.	.20
2	Large pails (good quality, 14 qts.), each	.	.	.60
2	Shallow tin pans	.	.	.20
1	Bottle butter color	.	.	.25
5	Yds. cheesecloth	.	.	.25
100	Lbs. dairy salt	.	.	.50
1000	Parchment wrappers, printed	.	.	2.50
240-lb	Union scales	.	.	6.00
500-lb.	Cream separator	.	.	\$55 to 75.00

FARM DAIRYING

Four-bottle tester, complete with glassware for testing milk . .	5.00
Tester for testing milk and cream .	5.50
Acidimeter (not necessary) . .	3.50

CHAPTER XXXI

CARE OF THE CHURN AND WOODEN UTENSILS

BEFORE using, strain about one-third of a pail of hot water into the churn, to scald it and fill up the pores of the wood. Remove the plug after revolving the churn once or twice, to allow the steam to escape, otherwise the steam may remove it without ceremony. After scalding, rinse with cold water, likewise strained. It is always advisable to chill the churn and not put cream into a freshly scalded one. Chilling the churn closes the pores of the wood and prevents the cream from sticking; moreover, the varying heat of a warm churn makes the churning temperature uncertain. It is easier to keep specks out of a churn than to get them out; and water from the well or the kettle is likely to have specks or scale in it. By placing a piece of cheesecloth over the strainer dipper it is an easy matter to strain all water that goes into the churn. It is better and quicker to pour the water out of the churn than to let it run through the bunghole. Floating dust will not then cling to the sides of the churn.

After using, the churn should be rinsed down

FARM DAIRYING

with hot water, which should be allowed to run out as it is poured in; then thoroughly scalded with boiling water to which a little washing soda or other cleansing powder has been added. This should be followed by another rinsing of clear hot water. For the scald and last rinse the lid must be on and the churn revolved. Wipe well the outside, but do not touch the inside with a cloth. Rubbing the varnished part with an oiled cloth keeps it bright and new-looking.

Never allow buttermilk or water to remain in the churn when not in use.

Leave the plug out and the lid ajar, and keep in a cool place to prevent warping.

The worker, spades, and butter printer may be prepared just before needed. With a fibre brush, a dipper of hot water, and a little salt, give them a good scouring and cool well with cold water. Using the brush and salt fills the pores of the wood more readily with water, and prevents the butter sticking to it. The brush and salt diminish the need of a large quantity of hot and cold water. The salt also cleanses.

After using the utensils remove any butter with hot water. Again scour with salt, rinse with hot water, and allow them to dry. Wipe only the varnished part of the worker. It is nice to have

FARM DAIRYING

squares of cotton to throw over the churn and worker when not in use. These keep the dust and flies from settling on them.

Lime is used freely in Danish creameries and dairies to clean and sweeten wooden utensils, and is gaining favor in this country. After scrubbing the utensils with hot water, while the wood is yet warm, cover the surface with a thick lime-wash and let them stand for a while, then wash off well. It is not to be recommended every time of using, as it hardens the wood too much.

Applied in the same way, lime has no superior for removing oil or grease from floors.

If the churn be washed occasionally with lime water it will keep it from getting an offensive smell. Lime takes the place of washing soda. It cleanses better and is cheaper. Patrons of creameries are recommended to use it instead of soda in washing their milk vessels.

CHAPTER XXXII

CARE AND RIPENING OF CREAM FOR CHURNING

WHILE collecting sufficient cream for a churning, it is best held in a good tin can, or for a small amount, a nice enamelled pail. A can is better than a crock. It is easier cleaned and scalded, and is lighter and handier to lift. A crock is liable to get broken or have the glazing



CREAM CAN



CREAM
LADLE



CREAM
STIRRER

chipped. It is very handy to have two cream cans. One may then be cleaned and well aired and the morning's skimming put in it, while the other still holds the cream ready to be churned.

FARM DAIRYING

The cream can should stand in the coolest place in the dairy or cellar, or in a tank of cold water in summer. In winter it may be kept in a room where the temperature ranges from 50° to 60°. The surrounding atmosphere should be clean and sweet. The can must always be covered, not necessarily air tight, though cream does not require ventilation.

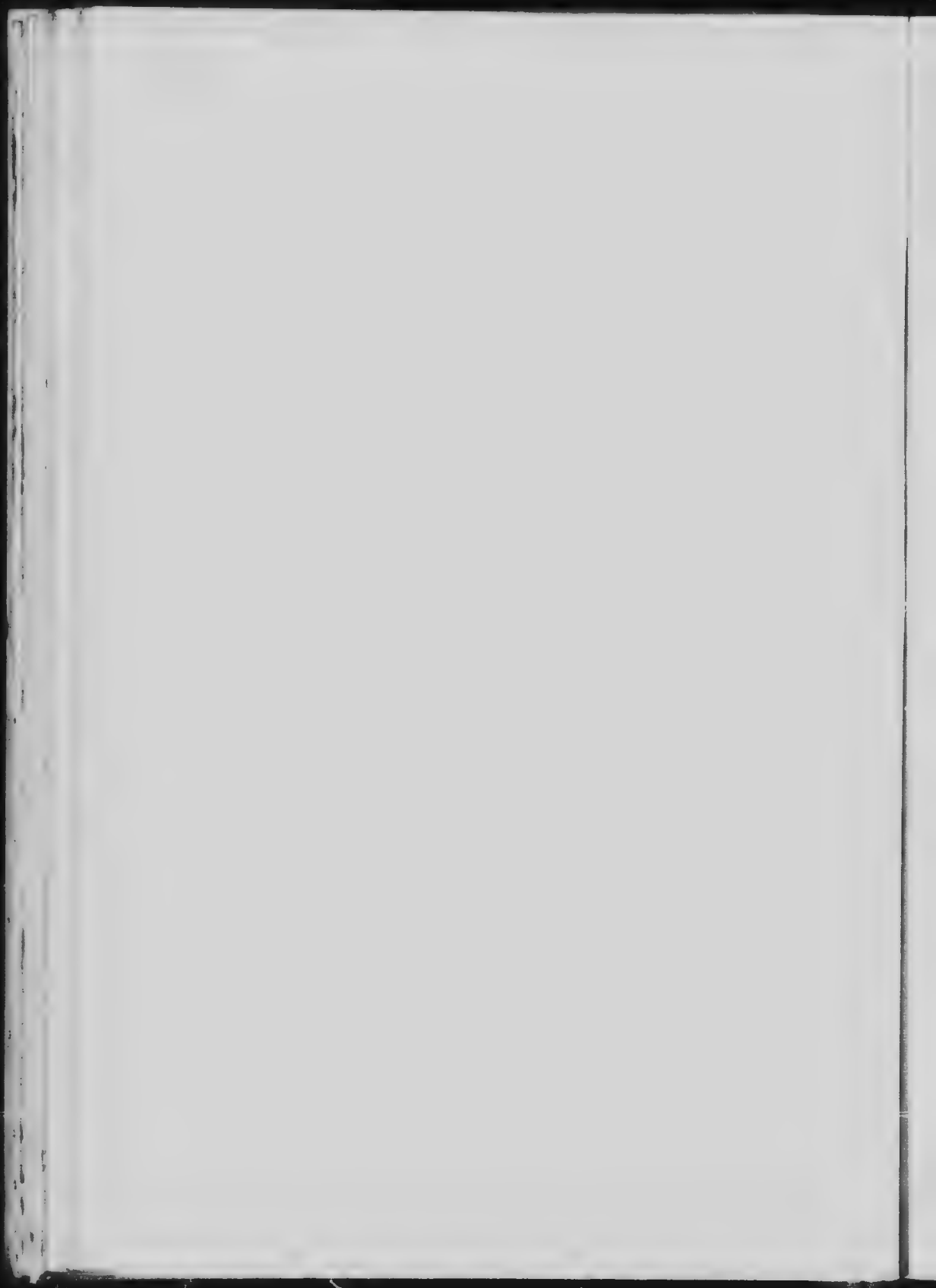
Have a long-handled ladle or tin stirrer which reaches to the bottom of the can, and stir the cream thoroughly, right from the bottom to the top each time fresh cream is added. The stirring motion should not be round and round, but up and down. A spoon or stick is a poor substitute for a proper stirrer or ladle. A cheap, convenient stirrer is made of a shallow tin saucer four inches across, with a heavy wire handle twenty inches long, well tinned and fastened in the centre of the saucer.

WHAT THE RIPENING PROCESS IS

The true souring of cream is caused by the lactic acid germs splitting up, or feeding on the milk sugar and forming lactic acid. This acid in turn acts on the lime which is associated with the casein in normal milk, and as a result we have the casein precipitated or coagulated, and we say the cream



COPPA HENGERVELD 2D'S BUTTERCUP, WORLD'S BEST HEIFER, OF ANY BREED, UNDER
TWO AND ONE-HALF YEARS OF AGE
GAVE 18 349.3 POUNDS MILK AND MADE 849.9 POUNDS BUTTER FIRST YEAR OF MILKING



FARM DAIRYING

is sour, for it has turned thick. The ripening process is one of decomposition, and if carried too far seriously injures the quality of the butter. The cream must be watched and the acid development checked, by lowering the temperature, if it is ripening too quickly.

When cream is ripened at a high temperature, or held for too long a time, there is apt to be an excess of acid, giving an old cream flavor to the butter. Always err on having too little, rather than too much acid.

SWEET *versus* SOUR CREAM

I predict the time is not far distant when but little ripened-cream butter will be made for the high-class market. The better educated and more refined the consumer is, the more discriminating is the taste. The demand for good butter is constantly increasing, and the creamy, delicate flavor obtained from sweet cream is growing in favor and commanding the highest price. It is really less work to keep the cream sweet where ice is put up, than to ripen it.

Some contend that the sweet cream does not churn as readily or as exhaustively. From years of careful experimenting with two portions of cream alike in every respect, save that one was sour

FARM DAIRYING

and the other sweet, I have found that five times out of six the sweet cream churned the quicker; but there was a slight difference in the weight of the butter — an average of not more than two ounces on seven pounds, in favor of the sour cream, which was due likely to less casein in the sweet-cream butter rather than to the slight increase in the loss of fat in the buttermilk.

No fresh cream should be added within eight or ten hours of churning; and it is well to have the cream at churning temperature, preferably below it, for several hours previous to churning. This applies to sweet cream as well as to the sour.

ADDING THE CULTURE

When beginning to collect cream for a churning, if it is to be ripened, add to your first skimming a culture which you know has a clean, pleasant acid flavor and smell.

This culture may consist of a cup or two of the sour cream on hand for churning, or the same amount of good-flavored sour skim-milk. I do not advocate the use of buttermilk as a culture. It may be all right, or again it may not be. It has had several more chances of going wrong from being in the churn, pail, etc., so for these reasons I prefer the sour cream. The object in adding cul-

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ture is that the bacteria which you know produce a fine-flavored butter may take possession of the new cream, before other germs, which might prove objectionable, gain control of it. (See Chapter XXIX, Culture or Starter for Ripening Cream.)

Another method of ripening cream is to hold it sweet, until twenty-four hours previous to churning, then heat it to 65° , and add one pint of culture to every gallon of cream; less culture may do. It is usual to add about ten per cent. When there is a slight acid on the cream, about .35 per cent, if it could be tested by the acidimeter, it should be cooled to churning temperature or lower, and held at that temperature over night. By morning it should be in right condition for churning. I prefer the first method outlined, as it is less labor, and if the cream be watched and the temperature lowered if the acidity appears to be developing too rapidly, it should not become overripe.

Cream from shallow pans usually has enough acid, without any culture being added. But butter made from it is not of such a uniform flavor.

Cream from the deep setting cans, owing to its being held all the time at a low temperature and thus checking bacterial growth, produces butter of fine flavor and good texture. It may be necessary in winter to heat the cream from deep cans to

FARM DAIRYING

55° or 60° before adding it to the cream can in order to develop sufficient acid by the time a churning is collected.



DEEP CREAM
CAN



DAIRY THER-
MOMETER

CARE OF SEPARATOR CREAM

The advent of the separator into many farm homes has meant a lowering of the quality of the butter, due to deficient care of the machine and

FARM DAIRYING

the lack of proper cooling of the cream. Separator cream should have the foam well stirred in. If left on the top, it soon dries, is apt to take on a bad flavor and appears as white flakes when the butter is made.

Separator cream must be quickly and thoroughly cooled. It is not sufficient that the vessel containing it be put in a cool place. Cream parts slowly with its heat, and during the delayed cooling bacteria are rapidly multiplying. The cream should be placed in cold water and frequently stirred, so as to quickly bring it to 55° or 60° in winter, and from 50° to 55° in summer. Under no conditions should the warm separator cream be added to the cream can. To get the best results, rapid cooling of the cream is an absolute necessity, but as soon as cooled it may be added to the cream can

AN IDEAL CREAM

Cream ready for churning should have a clean, pleasant, slightly sour taste and smell; should be of the consistency of molasses, and when poured be free from lumps and have a smooth, glossy appearance. It should have from .5 to .55 per cent acid, and from 24 to 28 per cent fat, if churned in a barrel churn. Cream of this richness yields about three pounds of butter per gallon.

CHAPTER XXXIII

BUTTER-MAKING

“Bread is the staff of life, but bread and butter is a gold-headed cane.”

EXAMINE the cream and take the temperature. If too cold it must be heated. It is a bad plan to bring the cream into a warm place to stand over night. It may be already quite sour, and during the long, slow heating process it is developing more acid and deteriorating in quality. Nor should it stand on or near the stove. One portion of the cream is sure to become overheated, the fat melts, and the curd toughens and appears later in the butter as white specks.

The proper method of heating cream is to set the can in a vessel of warm water at a temperature of about 120 degrees. Stir the cream constantly, watching the thermometer, and when it is within one or two degrees of the required heat lift it from the water; the heat in the can will usually bring the cream to the desired temperature. This takes only a few minutes, and is the surest and best way.

The necessity for the constant use of a reliable thermometer must be emphasized. The *finger*,

FARM DAIRYING

as a thermometer, is not the least bit of good. I might say here, in buying a thermometer have several placed in a glass of water at about 60° and take one which gives a medium reading. Suppose they read 61° , 59° , 57° . I would prick the 59° as likely to be the most correct. Cheap thermometers are often quite inaccurate.

TEMPERATURE FOR CHURNING

No definite temperature for churning can be given. That is ascertained only by studying varying conditions and noting the temperature and time of previous churnings.

Many conditions influence the churning temperature for cream:

1. The per cent of fat in the cream.
2. Quantity of cream in the churn.
3. The feed, breed, and individuality of the cows.
4. The length of time the cows have been milking.
5. The temperature of the room.
6. The make and speed of the churn.
7. Whether the cream be pasteurized or raw, ripe or sweet.

Aim to make conditions under your control favorable to a low churning temperature. It insures

FARM DAIRYING

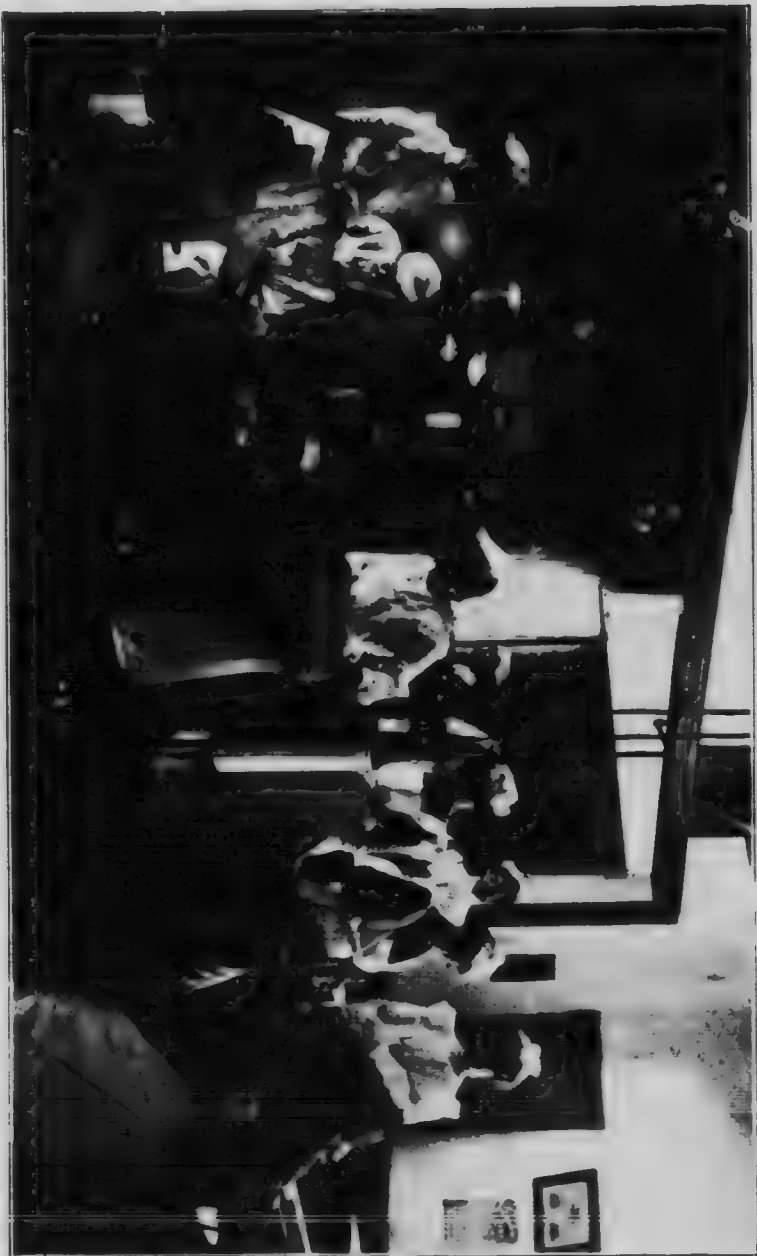
better butter and a more exhaustive churning. With right conditions a temperature which brings butter in from twenty to thirty minutes is correct. A range of temperatures from 54° to 58° for summer, and from 56° to 64° for winter, meets usual conditions.

The cream should always be strained into the churn through a fine wire sieve or a dipper with a perforated tin bottom. If the following dimensions were given to a good tinsmith he should make an extra nice strainer-dipper for fifty cents: 9 inches across the top; 7 inches across the bottom; 6 inches deep. The bottom should be of strong perforated tin (the perforations one-sixteenth of an inch across), and should have a rim around it. A strong flat handle 10 inches long, and a small piece of double tin, or strong wire loop, at the opposite side to act as a lip to keep the dipper from sliding into the churn, complete the dipper. A dipper of similar size, with a tin or copper bottom, is most useful in the dairy or the kitchen.

Never have the churn over half full, and it is better to start with less in it.

THE BUTTER COLOR

When necessary add just sufficient butter color of a reliable brand to give the butter a clear yel-



A DAIRY CLASS AT THE ONTARIO AGRICULTURAL COLLEGE

AUTHOR AT LEFT SIDE

FARM DAIRYING

low tint. Pure coloring is made from the pulp enclosing the seeds of the arnotto tree, and is harmless. The amount required will depend on the quantity and richness of the cream, the natural color of the milk-fat, the strength of the color, and the requirement of the market.

Do not depend on pouring in the coloring, but for a small churning count the drops into a spoon previously wet with the cream to prevent the coloring sticking to it. From two to four drops per pound of butter is sufficient. It is not necessary to stir the coloring in, just rinse off the spoon in the cream, and put on the lid.

THE SPEED OF THE CHURN

The revolutions of the churn depend on the amount and richness of the cream. The poorer the cream and the less of it, the greater the speed. Churn just as fast as you can so long as the cream drops. If the revolutions are too fast, the cream remains stationary in the churn and no concussion takes place. The greater the speed and the farther the drop of the cream inside the churn, the greater will be the force applied to the fat globules, and the more quickly they will mass together and form butter. Just before the separation of the fat from the milk serum, the cream thickens and

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takes longer to drop. The speed should be slackened at this point.

After the butter breaks, keep up the speed and watch the sight glass, to see how the butter is gathering. If the gathering process is coming on quickly, add a couple of quarts of water several degrees lower than the cream. We often have the water very cold, if the churning has been too quick. This water retards the gathering, lessens the likelihood of over-churning, and gives a more exhaustive churning.

If conditions are normal the water may be added just before the churning is completed, revolving the churn rather rapidly after it has been added. The water thins the buttermilk. This gives the butter a better chance to float and the buttermilk runs off more freely.

WHEN TO DRAW THE BUTTERMILK

When the butter is the size of wheat grains it is sufficiently gathered. Look frequently at the inside of the churn lid. When no tiny specks of butter, and only a few large ones, are seen on it, the churning is usually finished. Other signs are: the butter standing out well on top of the buttermilk with foam bubbles over it, and when no particles of butter come with the first drawn

FARM DAIRYING

buttermilk. These are noticed if the buttermilk is allowed to run through the strainer dipper placed over the pail for catching the buttermilk. Any butter which may escape with the last-drawn buttermilk, is caught in the dipper and returned to the churn.

Make a drain through the butter to the bung hole, and rinse the butter with a little of the wash water. This makes the washing more effective, as it carries off a great deal of the buttermilk. An exhaustive churning should not leave over .2 per cent fat in the buttermilk.

There are many good reasons for having the butter in granular form, rather than in large lumps, when finished churning.

1. There is no extra loss of fat.
2. The buttermilk can drain away better, and may be more thoroughly washed out, as so much of it is not encased in the butter.
3. All portions of the butter are equally chilled with the wash water.
4. The salt may be more evenly distributed.

WASHING THE BUTTER

Temper the wash water in winter, having it from 50° to 56°, according to the condition of the butter and the temperature of the room. In

FARM DAIRYING

hot weather the wash water may be as cold as possible.

The water must be pure, or it will spoil the butter.

Use as much water as there was cream, and strain it into the churn through two thicknesses of cheesecloth. Immediately revolve the churn rapidly about a dozen times, then draw off the water, letting it run through the strainer dipper to arrest particles of butter. The more butter is washed the more it is robbed of its flavor. Good butter should be washed but once. If the butter has an objectionable flavor, or has come soft, or is to be packed for winter use, it should then get two washings.

Should the only water available not be cold, a cup or two of salt added to it slightly lowers the temperature, and helps to draw the buttermilk from the butter.

SALTING THE BUTTER

Salt in butter is a personal taste and the amount to use should be determined by the consumer, rather than by the producer. Give the customer what he desires, only try to guide his taste toward light rather than heavy salting. It is a positive shame to hide completely the delightful, delicate

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flavor of fine butter by an excess of salt. Use nothing but the best dairy salt; buy it in quantities and keep it in a clean, dry place. Salt absorbs odors and can become unfit for use. Very cold salt is apt to remain undissolved in the butter and may also cause uneven color.

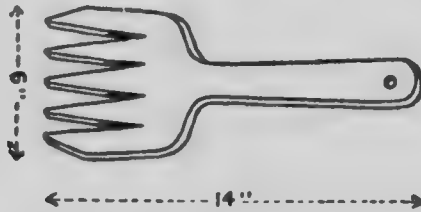
If the butter is for immediate use and is salted on the worker, three-quarters of an ounce per pound of butter is usually sufficient. If you salt it in the churn, use an ounce, as not so much is incorporated into the butter. For the high-class trade this would be too heavy salting. This trade calls for three things, light color, delicate flavor, little salt.

I strongly recommend salting in the churn. By so doing butter free from streaks can be had with the least possible amount of working. The only difficulty is in gauging the amount of butter in the churn. Where the supply of cream is from the same source the weight of butter may be estimated from the previous churning. If the weight of the cream and its percentage of fat are known, multiply these two together and divide by 84. This will give the pounds of butter. Do not guess at the amount of salt. Weigh or measure it. A rounding tablespoonful equals an ounce.

The butter should be in fine granular form, and

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salted immediately after the removal of the wash water. Often the butter is mottled and the salt undissolved on account of the butter being too dry from allowing it to drain too long before salting. Have the butter evenly spread over the bottom of the churn. Sift on part of the salt. Tilt the churn



WOODEN FORK FOR MIXING IN
SALT AND REMOVING BUTTER
FROM CHURN

forward to cause the butter to lap over; sift on more salt, then tilt the churn backward and put on the remainder of the salt. For a large churn a strong, large wooden fork is convenient to mix the salt in and also to take the butter from the churn.

After salting, put on the lid and *very slowly* revolve the churn, until the butter forms in several lumps. If too firm, it will be slow at gathering, and the lumps will be small. If too soft it will quickly gather into one large lump. The butter may now be taken out and immediately worked,

FARM DAIRYING

but it is much better for it to stand for an hour or two in the covered churn, to allow the salt time to dissolve, then give it one good working. Do not allow it to become too hard or too soft during the waiting interval.

If salting on the worker, take the butter from the churn, weigh it, and allow three-quarters of an ounce of salt per pound of butter. Spread the butter evenly over the wide end of the worker; sift the salt on evenly; fold the butter over the salt and begin working.

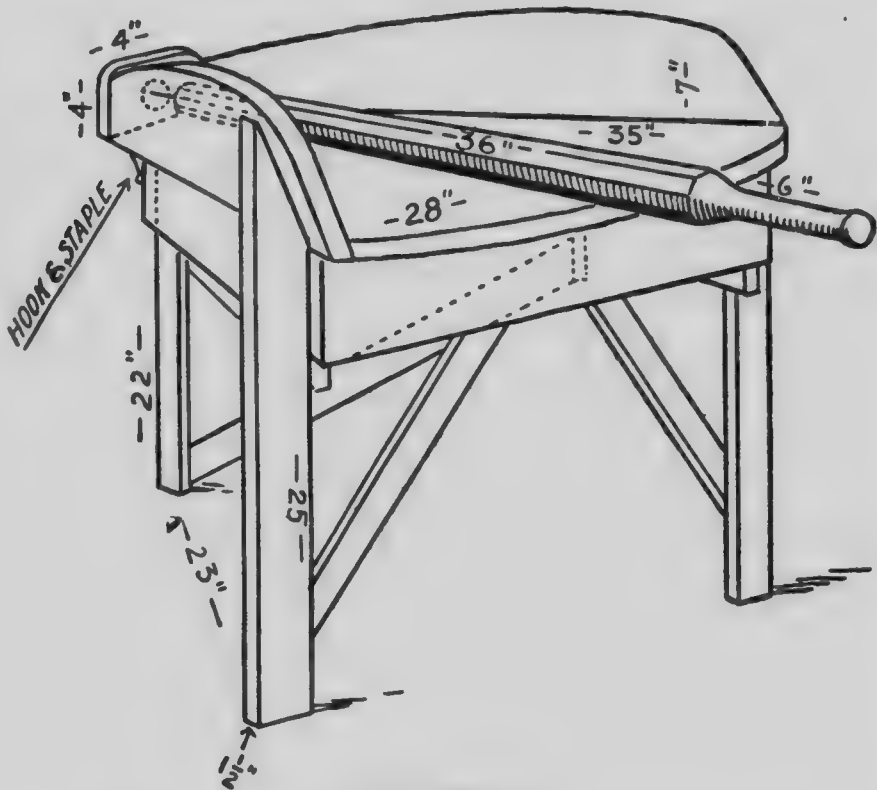
WORKING THE BUTTER

For the farm dairy there is nothing nicer than the V-shaped lever butter-worker. It is not expensive and is a great saver of time and strength, besides preserving the grain of the butter. A person handy with tools can make a better butter-worker than is turned out from a factory.

Begin working the butter in the centre of the worker and then work from side to side, slightly turning the pole over by a wrist movement. Work by pressure only, avoiding a sliding motion, as this makes a greasy, salvy butter. When the butter is levelled over the worker, with the spade toss a little of it back from the left side to get the pole down on the board. Revolve the pole from the

FARM DAIRYING

butter, and it causes the butter to fold over and form a large roll. Press the pole well into the butter at the right-hand ledge and with a quick



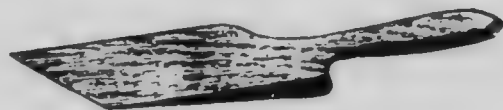
BUTTER-WORKER

movement make the pole bring the butter from the side. Shift the roll of butter lengthwise across the worker and begin again in the centre. From seven to ten times working in this manner is suf-

FARM DAIRYING

ficient. The butter receives but one working. When using the butter bowl and ladle, do not rub the butter, but rather press the ladle down into it. For a small amount of butter a clean bake-board and rolling pin may be used to work the butter, until something better is procured, but do not roll the butter, only press it.

Butter should be worked just enough to expel the excessive moisture and thoroughly distribute the salt. Any portion not reached by salt will be light in color. Usually the butter is worked sufficiently when a piece being cut and pressed be-



BUTTER SPADE

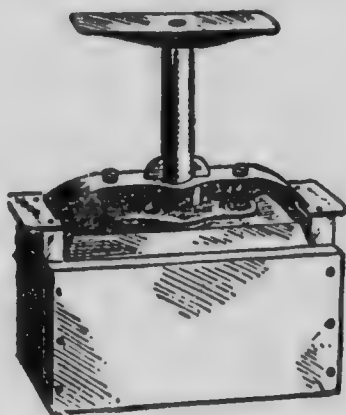
tween the spade and the worker, the heads or drops of moisture come out very fine, not in large drops or running away from the butter in streams. Better too much working than not enough.

If the butter is very soft or very hard, work it but slightly. Allow it to stand, and when at the proper firmness give it a second working. Butter worked when very soft is apt to be streaky in color. Butter worked when very cold may develop mottles.

FARM DAIRYING

PRINTING AND WRAPPING THE BUTTER

The brick-shaped pound-printer is the most popular form in which to market local butter. Make the surface of the butter level and press the printer



POUND BUTTER PRINTER

down into the butter until the mould is well filled. Cut with a butter spade the surplus butter from the bottom. In taking the butter from the printer, place the thumbs on top of the handle and the fingers under the ledge at the ends, and pull up, but do not press down hard. Pressing down bulges the print of butter at the sides.

Wrap the print neatly in good parchment paper which has been previously wet in clear, cold water. Good paper should be clear in color, fairly heavy,

FARM DAIRYING

and tougher when wet than dry. It is the right thing to have printed on the paper the name of the farm, or the maker; but it must be done with the proper ink, or it stains the butter. This trade mark is often the means of securing a choice trade. A little printer's ink used in the right place brings in good interest. Have on hand some plain paper, in case a churning is below standard. Sell it for what it is worth, but risk not your reputation by putting inferior butter up in your printed wrappers.

Be sure the print of butter weighs at least sixteen and a quarter ounces, when freshly wrapped in the wet paper. At each churning it is well to weigh a print. A slight allowance must always be made for evaporation.

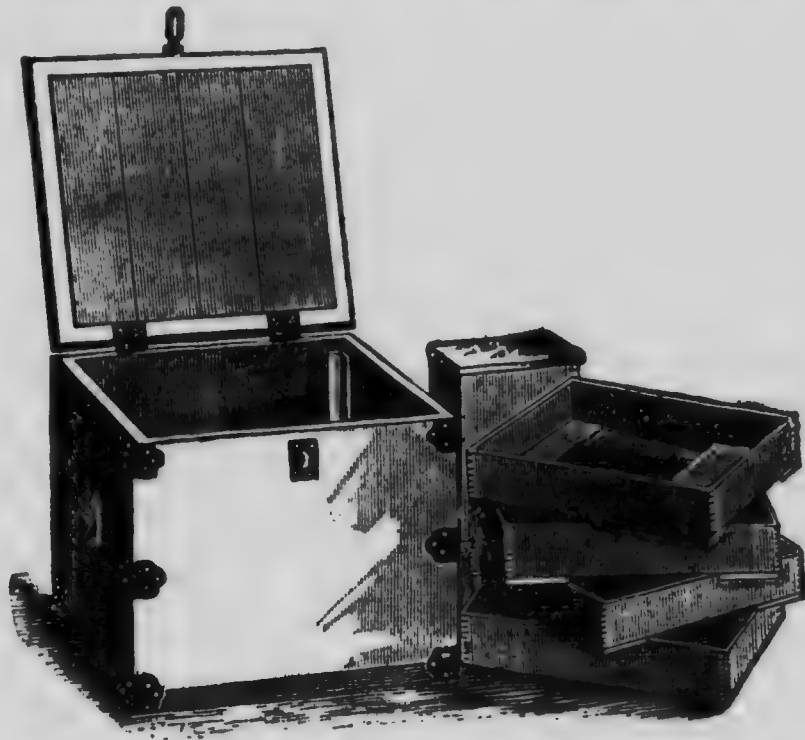
Keep the butter in a place where the atmosphere is cool, clean, and not too dry. If the place is dry, the moisture rapidly evaporates, lessening the weight and bringing the salt to the surface, where it crystallizes and gives the butter a poor appearance.

MARKETING

Get the butter, after it has firmed, as soon as possible to the consumer. Butter quickly loses its delicate, fine flavor. It always pays to cater

FARM DAIRYING

to the best trade. Such people are willing to give more for butter of extra quality, and when they become used to a certain choice flavor they will take no other brand. It is well to note that the



BOX FOR SHIPPING PRINT BUTTER IN WARM WEATHER,
FITTED WITH ICE CHAMBER AND BUTTER TRAYS

memory of quality lasts long after the price is forgotten. Endeavor to fill your orders, even at great inconvenience to yourself.

FARM DAIRYING

In summer many town customers prefer getting their butter in five-pound stone jars or crocks, as they are handy to keep in a refrigerator, and the butter stands transportation from the farm to the customer better than when in prints, especially if it has to be taken a long distance in the heat.

BRINE FOR KEEPING BUTTER

If one has on hand quite an amount of butter in rolls or prints for home use, it will keep much better if put in a strong brine. Use a cup of salt to two quarts of boiling water. When the brine is cold put the butter in it in a crock, and put a plate on top to weight the butter down.

AVERAGE COMPOSITION OF BUTTER

Fat	.	.	84	per cent
Casein	.	.	1	" "
Salt	.	.	3	" "
Water	.	.	12	" "
<hr/>				
Total	.	.	100	" "

CHAPTER XXXIV

DIFFICULTIES IN CHURNING — CAUSES AND REMEDIES

“Few things are impossible to diligence and skill.”

ALMOST all the difficulties met with in the dairy can be avoided by wisdom and care; but as they do come, it is expedient to know how to meet them. The causes of cream not churning within a reasonable time are various:

1. Too much cream in the churn. If it swells and nearly fills the churn, concussion practically ceases. Remedy: Take out half the cream and make two churnings. It will save time, butter, and patience. A person is almost a saint who can be good-natured at the end of three hours' hard churning. *Never fill the churn over half full.*

2. Cream too poor in fat. Where there is a large amount of skim-milk in the cream, the fat globules do not have the same concussion or chance of coming in contact and massing together. Such cream requires a high churning temperature to soften the globules, so that with the lessened force and contact they may adhere to each other. Remedy: If the temperature has been low at starting,

FARM DAIRYING

and if after churning over half an hour there is no sign of butter, pour the greater portion of the cream out into a can or pail, and set it in a vessel of warm water, stir constantly and raise the temperature of the cream eight or ten degrees and return it to the churn. This takes but a few minutes. Never add hot water directly to the cream. It melts the fat, curdles the casein, and produces a pale-colored, weak-bodied butter with white specks of curd through it.

If this poor cream comes from pans or deep cans, allow the milk to stand longer before skimming and remove the cream more carefully. If from a separator, adjust the screw to take a richer cream, and be careful no water or skim-milk runs into the cream can. Remember that cream poor in fat always means a serious loss of butter in the buttermilk.

3. Sometimes the butter breaks, but will not gather. It remains like fine hay seed or rounds up like small shot. This is due to one or more of four causes: cream poor in fat; cream cold; cows getting nothing but dry food; cows milking a long time.

The fat globules in strippers' milk are small and of a hard tallowy nature, making a high churning temperature necessary. Sometimes there is

FARM DAIRYING

present in such milk, a viscous substance which prevents the massing of the globules. I have known many people to lose churning after churning from this cause. To scald such cream while it is sweet (heat it to 185°), and then cool, is a wonderful help in churning it.

A fresh cow coming into the herd has a marked effect in improving the churnability of the rest of the cream.

The dry condensed feed of winter produces butter fat which has a melting point several degrees higher than the fat produced from the succulent green food of summer. This accounts for the necessarily higher churning temperature in winter. A judicious selection of foods materially helps the churning. Cotton-seed cake, hay, and straw, tend to harden butter. Linseed cake, silage, and root have the opposite effect, and make churning easier. Remedy: If there is no sign of the butter gathering after breaking, when you have churned for five minutes slowly, or when, on looking at the lid, the granules appear to be rounding up, to churn longer, without doing something, is useless. Add two or three quarts of water several degrees warmer than the cream. The water dilutes the buttermilk and causes a better separation of the butter. Revolve the churn a few times, let stand



A SPLENDID SPECIMEN OF MILKING SHORTHORN



INOQUETTE, A FRENCH CANADIAN COW

FARM DAIRYING

a little while, then draw off about half of the buttermilk, straining it through a fine sieve or strainer to catch any particles of butter. The liquid thus reduced, and the churning continued, the butter should soon gather into the required-sized granules. In cases of very poor cream, it may be necessary to reduce the buttermilk further.

4. Churning in a cold room will lower the temperature sufficiently to retard the coming of the butter. Remedy: Warm the cream as before described. Start with the cream warmer than usual under such conditions.

5. Very rich cream will thicken, or "go to sleep" in the churn, and concussion ceases, or nearly so. Remedy: All that is necessary is to add water or skim-milk at churning temperature or a little lower to thin the cream, so that it can again fall in the churn.

6. The very slow revolving of the churn causes unnecessary delay in having the butter come. Remedy: Churn as fast as you can, so long as you allow time for the cream to drop. The greater the speed, the greater the force exerted on the fat globules.

7. Occasionally cream foams badly, almost filling the churn. Such cream is usually poor, cold, and has present a gas-producing ferment. Rem-

FARM DAIRYING

edy: Sometimes a handful or two of salt and a little water at 70° or 80° , settles the foam. If this does not do, remove part of the cream and raise the temperature about ten degrees. In very stubborn cases, as a last resort I have added almost as much water at about 70° as I had cream, revolved the churn a few times, let stand several minutes, then drew off most of the liquid and after churning a short time have succeeded in getting butter. I have known cream to rise over the cream crock like yeast. A yeast germ or some other gas-producing organism was at work. In such a case, pasteurize the sweet cream, and thoroughly disinfect everything which comes in contact with the milk or cream

8. In rare cases in summer I have had churnings where the butter would not come, and on examining the lid of the churn, I could see minute, shiny specks of oil, as if the butter fat were in a liquid form. Remedy: Adding several quarts of ice-cold water has brought the butter in nice granular form. This difficulty is more likely to occur when the cows are on very soft, watery pasture. Rank green clover often makes difficult churnings for the same reason—lack of “body” in the milk-fat.

9. When the butter color has been forgotten,

FARM DAIRYING

I have heard " Oh, my! I did n't put in the butter color." The mistake can be rectified, but it means more work. Weigh the salt required for the butter, and drop over it the same amount of color as should have been added to the cream. With a thin-bladed knife thoroughly mix the color into the salt and sift it over the butter. Proceed with the working as usual. The butter will seem in a hopeless condition. Allow it to stand for a while, then carefully work it until all the streaks of color disappear. I have added the butter color in this way and the butter scored full for color.

CHAPTER XXXV

DEFECTS IN BUTTER

LIGHT streaks or waves are due to the presence of buttermilk and an uneven distribution of the salt. Salt brightens the color, and where it does not reach, the butter is paler. This defect often results when the butter is soft and the working stopped before the salt is well distributed. It is better to overwork the butter than have the color uneven.

Mottles are usually caused by washing the butter with too cold water and chilling the outside surface of the granules, or working it when very firm. There are portions of the butter in such cases that are not reached by the salt, and this causes the mottled appearance.

Undissolved salt results from not enough moisture in the butter to dissolve it, or using very coarse salt, or having it very cold, and the butter firm.

Greasy, poor texture comes from churning at a high temperature, washing with too warm water, over-working, or working with a sliding motion.

White specks are particles of hardened curd, caused by having the cream too warm, too sour, or not frequently and thoroughly stirred while

FARM DAIRYING

ripening. Scrapings of dried cream, or the crust on unstirred cream, due to evaporation, may cause white flakes in the butter.

Leaky, water-logged butter is over-charged with moisture from high temperature in churning and washing, gathering the butter into lumps in the wash water, and giving it but the minimum amount of working. The maximum amount of water allowed by law is 16 per cent. Butter usually has from 12 to 15 per cent.

Off flavors in butter may be traced to decayed or muddy food, — weeds, turnips, etc., over-ripe cream, impure water, absorption of odors from the atmosphere in the stable or cellar or kitchen, contamination by dirt, sick cows, cows long in milk, or keeping butter at too high a temperature or in unsanitary surroundings.

CHAPTER XXXVI

PACKING BUTTER

NOT much butter, at the present time, is put down for winter use. When the price gets low in summer and the milk supply in winter is scarce, it is using foresight to pack a crock or two of butter. June and September are the best months for making butter for winter use. I prefer September, when the cows are on the aftermath and the extreme heat is past.

Extra care should be taken in handling the milk and ripening the cream, so as to have a good clean flavor to begin with. Pasteurizing the cream adds to the keeping qualities of the butter. Wash the butter twice and salt one ounce to the pound if salting on the worker; or one and a quarter ounces in the churn.

It is better to either give it two workings, or allow it to stand in the churn, after salting, for two hours, and then give it a good working.

Pack a clean, well-glazed crock, which has been scalded two or three times with boiling salt water. If a new or old wooden firkin be used, be sure to treat it in the same manner. A firkin should not leak. Put the butter in in small pieces, pounding

FARM DAIRYING

from the centre toward the outside so as to have no holes or air spaces. A wooden potato-masher answers as a pounder. Fill to within half an inch of the top. Level off neatly. Cover with parchment paper or cotton, then a layer of salt moistened with water to form a paste. Put on the cover and tie down with several thicknesses of clean paper.

Keep in a cool, clean place, where the temperature does not vary. The great secret of keeping butter is to have it good at first and keep it cold. When the weather gets to freezing point, take the butter from the cellar, and put it where it will freeze. The crock will not crack.

When using the butter, take out a pound or two at a time, leaving the crock in the cold.

PRESERVATIVES IN BUTTER

The commercial and the more common kinds of preservatives for butter, have been extensively experimented with at our agricultural colleges and creameries, and the conclusion reached is that pure powdered common borax gives as good results as the more expensive commercial preservatives. The quantity to use should not be more than from one-quarter to one-half of one per cent. That would be from one to two ounces of borax to

FARM DAIRYING

twenty-five pounds of butter. Mix it thoroughly with the salt, and sift the salt on the butter as usual.

Borax in such small quantities is quite harmless, and adds to the keeping qualities of the butter. However, its use is to be recommended only where butter is to be kept for several months, and where the temperature is not under control.

CHAPTER XXXVII

BUTTER FOR EXHIBITION

THE exhibitor, if possible, should see personally to the care of the cows and the food they get. Fresh grass, sweet green corn, bran, oats, and a little cotton-seed cake would make a good ration to secure sweet-flavored, good-textured butter.

Pasteurize at 160° if there be any fear of off flavors.

If the cream is ripened, have the acid in it mild, not more than .5 per cent acid. Churn at a rather lower temperature than usual to ensure a firm granule. Avoid high coloring. Salt at the rate of not more than three-quarters of an ounce per pound, weighing the butter and salting on the worker to ensure careful work.

Work slightly, and allow it to stand two or three hours where the butter will neither get too hard nor too soft, then give it another working. This should give an even color, which cannot be guaranteed with one working. Judges score down heavily for streaks or mottles. Save out a print and examine it yourself.

Have the prints without hole or blemish. Let

FARM DAIRYING

them stand to firm for a while, before wrapping neatly in the wet parchment paper. Place them in a refrigerator, or in a box surrounded by ice, and let them get chilled through and through, and see that they reach the exhibition in the same condition.

These little points observed or neglected often win or lose a valuable prize, to say nothing of the honor. Many times there are not over one or two points difference between the first and third prizes, but there may be many dollars' difference in the awards.

Butter in crocks may have slightly more salt, but not necessarily so. Never fill the crock more than within half an inch of the top. Cover with a circle of cotton or parchment paper, and omit the layer of salt.

Make exhibition butter at least two days before it is to be judged. This gives time for a developing of flavor, an evening of color, and a firming of texture.

After doing your very best to secure first place, graciously abide by the decision of the judge, if you fail. Judges try to work by an established standard, putting personal taste aside, and endeavor to do their work conscientiously. It is no easy task, as I know from a long experience, to

FARM DAIRYING

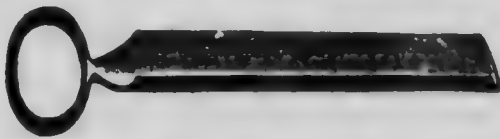
place score cards on numberless entries of butter, nearly all of excellent quality.

QUALITIES OF GOOD BUTTER: HOW IT IS JUDGED

It is well to know what a judge looks for in a No. 1 butter, and work up to his requirements. Judges now almost universally use a score card, and the marks are approximately as follows:

Flavor	.	.	.	50
Texture or Grain	.	.	.	20
Color	.	.	.	15
Salt	.	.	.	10
Package	.	.	.	5
				<hr/>
Total	.	.	.	100

In judging, to get a representative sample of the butter, a trier is used, which when inserted into the butter, and given a half turn round and then



BUTTER AND CHEESE TRYER

withdrawn, brings with it a plug of butter half an inch thick and about four inches long. Still longer triers may be used for tubs and boxes. This plug reveals defects in aroma, flavor, color,

FARM DAIRYING

moisture, and grain, which might escape the notice of the judge if he merely cut a piece from the surface of the butter with a penknife.

The paramount consideration, both of the judge and the purchaser of the butter, is *flavor*. Of the five qualities considered, one-half of the 100 points are given to flavor. Fine workmanship is at a discount if the good taste be lacking. Butter of delicate, pure creamy aroma and flavor, the result of little acid in well cared for, good cream, is growing in favor and scoring highest.

The *grain, body, or texture* of butter should be waxy, breaking off like steel — firm, yet easily spread, not having a greasy, oily feel and taste, nor melting too readily on the tongue. The moisture should be free from buttermilk, finely distributed, and not excessive.

The *color*, a clear, bright, straw yellow, pale rather than high, free from streaks or mottles or specks. Evenness, more than shade, of color is considered.

Salt moderate and all dissolved.

The *package* neat and pleasing to the eye.

CHAPTER XXXVIII

THE RETAIL MILK TRADE — THE PRODUCERS' AND CONSUMERS' RESPONSIBILITIES

THERE is no more remunerative method of disposing of milk and cream from the farm than supplying the retail trade. At the present time there are few businesses which, if viewed in the proper light, present such a serious aspect.

Milk is almost the sole food of the infant man the first year or two of his life. He depends entirely on it during his frailest and most helpless period. A great number of babies have to depend solely on cows' milk for their nourishment. The purity of the milk has a marked influence on the health of the child. Milk laden with bacteria is always more or less unwholesome, and may to infants be actually and actively poisonous, giving rise to vomiting, diarrhœa, and gastro-intestinal disturbances. I would not unduly alarm, but to read statistics of the mortality of infants, and to see the great number of deaths said to be directly attributed to bad milk, makes one shudder at what is going on. It appears like murder without intent. These conditions exist most in large cities

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where the milk is shipped from all quarters for great distances.

When a farmer sends off a can of milk, he has no idea into what homes it finds its way. Some is likely to go to feed a tiny baby; some, the very sick; and some, the enfeebled aged; all with weak digestion and low vitality, all depending on the milk to strengthen and build them up.

The man who supplies a city or town milk trade should think of these things, should think of the lives he really holds in his keeping. Dirty, bad milk causes death; clean, good milk is the life giving fluid which brings health and strength. The cow has little to answer for personally in regard to bad milk.

There are but two things necessary to keep the milk pure and sweet. *Keep the milk clean, then the bacterial content will be low. Quickly cool the milk and keep it cold and the bacteria which are in it will cease to develop.* Pasteurization is recommended, but where the other two requirements are rigidly enforced, it is not necessary; besides, pasteurized milk does not agree with every one.

In some Provinces and States there is legislation regarding the percentage of fat and total solids in milk. Vastly more important is it that a certain standard of purity be enforced. There is no



STYLES OF MILKING STOOLS



THE ROSE TWINS

FOR THE DEAR CHILDREN'S SAKE MILK SHOULD BE PURE

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more vital food problem than that of the milk supply. Some go so far as to say that dairy farms should be under municipal management just the same as the water system. Every detail of the milk trade would then be under special inspection, which should result in supplying purer milk and lowering the death rate among infants.

The ideal method for preparing milk for retail is, first, to have the milk of best quality. Take it to the milk-room separate from the stable, and immediately cool it to 45°. Then bottle in sterilized bottles and seal the tops with paraffined paper caps. It should be shipped as soon as possible, either packed in ice or in refrigerator cars. Milk should reach the consumer not later than twenty-four hours after it is drawn.

When we see oysters, ice cream, etc., carried in paper pails, the paper milk bottle may come into use in the near future. It certainly would do away with the dread of badly washed glass bottles.

As bacteria lurk in the crevices of imperfectly cleaned vessels, all pails and cans in which milk is placed should be thoroughly cleaned and scalded. It is most important that there be no hidden nooks and corners in the tinware. Blind seams and crevices are breeding-places for the worst forms

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of germ life. A liberal use of solder renders the inside of pails, cans, dippers, and strainers perfectly smooth and cleanable.

Not until we get the consumers roused to the importance of clean milk, will conditions greatly improve. To most of them *milk is milk*, and that is the beginning and end of it. They should be concerned about its source. Are the cows healthy? Is the milking done in a cleanly manner? Is there any contagious disease among the attendants? These are questions about which the housewife should concern herself. When milk is guaranteed pure, it usually commands a higher price: extra precaution entails extra expense.

The milk often becomes bad after it is received from the milkman, because it is not properly cared for in the home. Too frequently the milk is put into a jug or pail which has only been rinsed since being emptied of milk. *All milk vessels must be scalded.* Another bad practice is allowing the milk to stand on the kitchen table or in some other warm place. The milk should be covered and kept in a cool, clean place. It is a good plan to place a square of clean, wet cotton over the milk pitcher. In warm weather, when souring is feared, it is a wise precaution to heat it to 185° and quickly

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cool it. Danger from disease germs also is averted by doing this.

The souring of milk during a thunderstorm is due, not to the thunder, but to the warm, sultry weather preceding the storm, making conditions favorable to the rapid growth of bacteria.

Do not place a bowl or jug on the door-step for the milkman to fill. The dust falling into it may be sufficient to spoil the milk.

CHAPTER XXXIX

THE RETAIL CREAM TRADE — HOW TO STANDARDIZE MILK AND CREAM

CREAM for retail should receive the same care as has been already described for milk. Cream is generally sold by the quart or gallon, and should be of a stipulated per cent of fat. Commercial or single cream usually contains from 20 to 25 per cent fat. Double cream 40 per cent. It takes three and one-third pints of 20 per cent cream to make a pound of butter. By comparing the price obtained for cream with that for butter, one can ascertain which is the better way of disposing of the cream. Practically speaking, 100 pounds of 4 per cent milk will make 20 pounds (2 gallons) of 20 per cent cream.

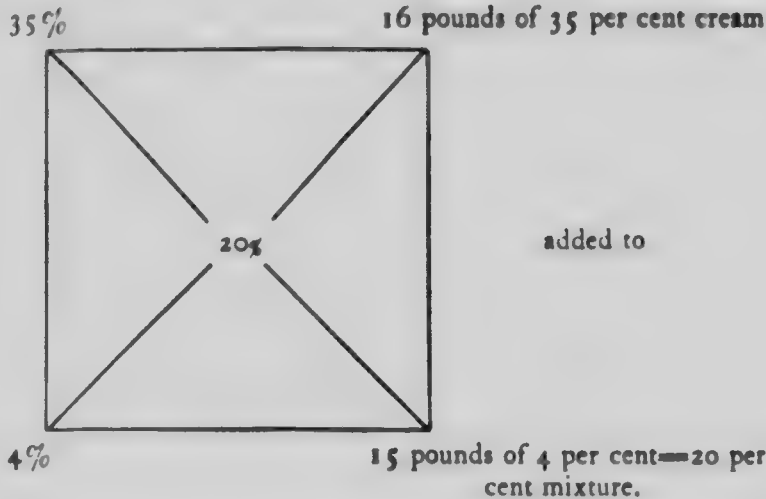
Prof. R. A. Pearson's simple method for bringing cream or milk of any percentage of fat to a desired percentage of fat may be useful:

Draw a square and join the corners with two cross lines. Put the desired per cent fat in the centre, and the per cent already in the cream at the upper left-hand corner, and the per cent of fat in the milk or cream (or it may be skim-milk with no fat) in the lower corner. Subtract the smaller

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numbers from the larger, and put the difference in the opposite corners, and the mixing will have to be in that proportion.

Example: What proportion of 4 per cent milk would you add to 35 per cent cream to reduce it to a 20 per cent cream?



Therefore the two are mixed in the proportion of 16 parts cream to 15 parts milk; or to every pound of 35 per cent cream you would add fifteen-sixteenths of a pound of 4 per cent milk. This works true with any percentage.

VISCOGEN, SUCRATE OF LIME, OR CREAM

THICKENER

The purpose of viscogen is to restore to pasteurized cream its normal consistency. The pas-

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teurizing process makes rich cream very thin in appearance. This thinness is apt to deceive the consumer as to the richness of the cream, and its natural thickness may be restored by adding a small quantity of viscogen. This substance is perfectly harmless, and does not change the taste of the cream if too much be not added.

Viscogen may be made as follows: Take one pint of sugar to two pints of water; boil into a syrup. Make a separate mixture of one pint of clean fresh lime and three pints of water. Mix the syrup and the lime solution thoroughly together by shaking well in a bottle. Give an occasional shake. The next day pour off the clear liquid and store in clean bottles. Keep well corked.

Use one ounce, or two tablespoonfuls, to one gallon of cream.

A teaspoonful of viscogen added to the cream pitcher improves the cream for strawberries, etc.

CHAPTER XL

MILK PRESERVATIVES

IT is a crime to add to the milk or cream any preservative. There are few, if any, that are not injurious, and many are really poisonous. Agents will sell a powder or solution which, if used to rinse the cans, will prevent the milk from souring. Surely such an argument should arouse suspicion. These so-called remedies have been known to contain enough formaldehyde (a poison) to be dangerously harmful.

The farmer may add a little preservative saying, "This pinch cannot do any harm." The wholesale man, not knowing what has already been done, adds his small portion; and the retail dealer, who runs the greatest risk of the milk souring, puts in an extra dose. No one is able to sum up the sad results.

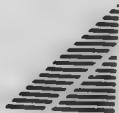
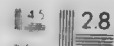
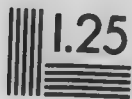
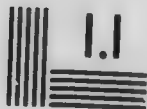
When ordinary milk does not sour under usual conditions within a reasonable time, there is something wrong.

More attention is each year being given to the retail milk trade. Legislative sanitary inspection of the milk, cows, and stables, and the establish-



MICROCOPY RESOLUTION TEST CHART

ANSI and ISO TEST CHART No. 2



APPLIED IMAGE Inc.

300 North Zeeb Road
Warren, Michigan 48090
248-298-5984 Fax

FARM DAIRYING

ing of pure-milk depots to supply milk for infants especially, are lessening the evils.

Milk produced under the best of conditions, cooled immediately, and bottled, has been kept sweet for eighteen days in the heat of summer. The milk was not pasteurized. Cleanliness and prompt cooling were the only preservatives. We can recommend no others.

CHAPTER XLI

MILK DEFINITIONS

S*TANDARD Milk* is milk which conforms to certain requirements which usually specify the minimum per cent of fat, and solids-not-fat, and sometimes the maximum number of bacteria per cubic centimetre allowable in milk offered for sale. The amounts required or permitted differ in different countries.

Sanitary Milk, Guaranteed Milk, are terms applied to milk produced under conditions necessary to secure a pure, wholesome product.

Certified Milk is milk produced under ideal conditions,—healthy cows, especially adapted sanitary stables, healthy clean milkers. The milk is bottled, sealed, and shipped in refrigerator cars, and certified to by a commission.

Modified Milk, or Humanized Milk, is milk containing definite proportions of fat, sugar, casein, etc., put up usually according to the prescription of a physician, who indicates how much of these different constituents is required.

Clarified Milk is milk which has been run through a separator to remove some of the im-

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purities. The skim-milk and cream are afterwards mixed.

Pasteurized Milk or Cream is milk or cream which has been heated below the boiling point, but sufficiently to kill most of the active organisms present, and immediately cooled to 50° or below. Pasteurizing temperatures range from 140° to 185° .

Sterilized Milk is milk that has been heated to the temperature of boiling water (212°) or higher for a length of time sufficient to kill all organisms present.

Condensed or Evaporated Milk is milk from which a considerable portion of water has been evaporated. The sweetened brands contain a high percentage of cane sugar.

Peptonized Milk is milk to which some pepsin has been added in order to make the milk more easily digested.

Electrified Milk is treated by a current of electricity for the purpose of destroying bacteria.

Malted Milk is milk that has been pasteurized to destroy the bacteria, then partly condensed, and a small quantity of malt added.

Milk Powder is obtained by evaporating the moisture from whole milk, partly skimmed milk, or skim-milk. The powder is used by confection-

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ers, certain manufacturers, surveying parties, and in such countries as the basin of the Yukon.

Koumiss is the product made by the alcoholic fermentation of milk caused by adding yeast and sugar to it.

CHAPTER XLII

FARM CHEESE-MAKING

"The manufacture of cheese is one of those provident processes, instinctive to all mankind, by which food in a time of plenty is transformed into a state suitable for keeping until a time of need."

MOST country people are English enough to like home-grown and home-made food products. This is mainly why the making of small farm cheeses appeals to them. If made at the time of the year when milk is cheapest, one can produce an extra nice quality of cheese at a very reasonable cost.

Cheese does not hold its proper place in our dietary. It should be more largely used on our tables, and should often take the place of meat at a meal. A well-made, well-cured cheese is highly nutritious, not hard to digest, and if made in the home, would be more freely used.

The process of manufacturing cheese on the farm should be as simple as possible; and the time from starting until the cheese is put to press should be between four and five hours. The milk must be sweet and pure, and especially of good flavor. If the fresh morning's milk be mixed with

FARM DAIRYING

the previous day's milk properly cared for, it is usually in about the right condition for making cheese in regard to the acidity.

In factory work much stress is laid on having the milk at a proper ripeness before setting it, and either the acidimeter or the rennet test is used to determine the amount of acid present in the milk. With the acidimeter it should show from .18 to .19 per cent of acid; by the rennet test, 20 to 24 seconds, when in condition for setting.

THE VAT

A large tin, or churn, or new tub; in fact, any clean vessel which will hold milk and not injure it, will answer as a cheese vat.

TEMPERATURE OF MILK

Heat the milk to 86° by setting it on the stove and stirring, or by placing a clean can of hot water in it. Be prepared to go on with the work, or the milk kept at this temperature may develop too much acid.

THE COLORING

If the cheese is to be colored, use a small teaspoonful of cheese color to 100 pounds of milk (10 gallons). Add the color to a pint of the milk, and stir well into the milk in the vat.

FARM DAIRYING

RENNETING

For every 25 pounds of milk use one teaspoonful of rennet. Try to get the rennet at a cheese factory; junket or rennet tablets, such as druggists sell, are often not satisfactory. Dilute the rennet in a pint of cold water and pour it in a stream up and down the milk, stirring well all the time and continue stirring two or three minutes. Cover the vat to keep the milk warm.

Try the milk occasionally to see when it has sufficiently coagulated, by inserting the index finger into the curd and with the thumb making a dent or slight cut in the curd just at the base of the finger; then slowly moving the finger forward, if the curd breaks clean like a firm but tender custard, it is ready to cut. The time from setting or adding the rennet to cutting is usually about twenty minutes. The older or riper the milk, the more quickly the rennet will act upon it. Over-ripe milk will give a dry, acidulous cheese.

CUTTING THE CURD

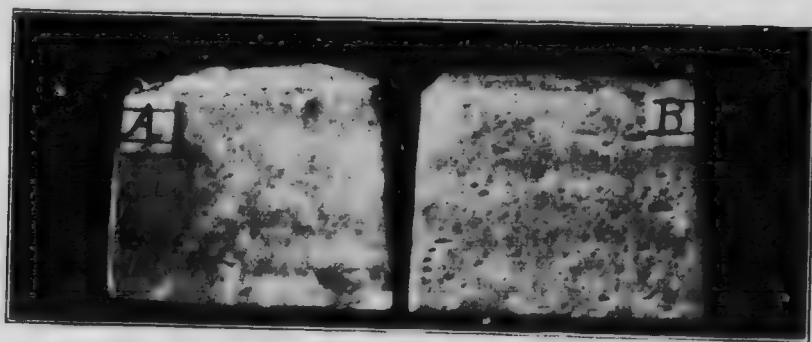
If you expect to make much cheese I would advise getting a set of curd knives. Use the horizontal knife first, cutting slowly lengthwise of the vat. Then with the perpendicular knife cut crosswise and afterwards lengthwise of the vat. This



PERPENDICULAR CURD KNIFE



HORIZONTAL CURD KNIFE



A. CURD FROM MILK COOLED BUT NOT AERATED. B. CURD FROM MILK AERATED AND COOLED

SHOWING THE IDEAL WAY OF CARING FOR MILK IS IMMEDIATELY COOLING WITH ICE OR COLD WATER WITHOUT AERATION OR EXPOSURE TO THE AIR. THE NUMEROUS ROUND HOLES WHICH ARE SHOWN IN THE PIECE OF CURD MARKED "B" ARE THE RESULT OF THE GROWTH OF GAS-FORMING BACTERIA IN THE MILK. THE HOLES WHICH APPEAR IN THE CURD MARKED "A" ARE NOT GAS HOLES BUT ARE MERE MECHANICAL HOLES. THE FORMATION OF GAS HOLES IN THE CURD IS USUALLY ACCOMPANIED BY VERY OBJECTIONABLE FLAVORS.

FARM DAIRYING

makes the curd into cubes from a quarter-inch to a half-inch square, according to the knife used. For factory work the quarter-inch wire knife is highly recommended. While more tedious, a long-bladed carving knife or a thin-bladed sword answers the purpose. First cut lengthwise into strips one-third inch wide, then crosswise the same, then horizontally as well as you can. Begin stirring gently and continue the cutting, if the carving knife is used, till the curd is of uniform size.

COOKING

While the stirring is going on, heat may be slowly applied. The vat may be set in a vessel holding warm water, or a clean can filled with hot water may be put into the vat. After the whey has separated pretty well from the curd, a pailful may be dipped out and heated to 130° to 140° . Do not have any curd in the whey. The warm whey is returned to the vat, and in a little while more whey may be dipped out and heated. Half an hour should be taken to get the curd heated to 98° . If heated too quickly the curd does not expel enough moisture, and a weak-bodied cheese is the result. It is a bad fault to get the curd too warm. After it is brought to 98° it is not necessary to stir continuously, but it must be frequently

FARM DAIRYING

stirred to prevent the curd from matting, and the temperature must be maintained. It is well to keep the vat covered.

DIPPING

The curd is usually ready to dip in from three and a quarter to three and a half hours from the time the rennet is added to the milk. The right condition for the curd to be in at this stage may be ascertained by feeling the curd. If it is rather firm, has a shiny appearance, and falls apart when pressed in the hand, it is ready to have the whey drawn. By the acidimeter it should show from .18 to .19 per cent of acid; or when a little of the curd is squeezed well in the hand and pressed against a hot iron (a stove poker answers the purpose) and gently withdrawn, if it leaves hair-like threads a quarter of an inch long on the iron, it is a sign the whey should be removed.

If the vat is without a tap, dip the curd and whey into a strainer dipper or colander, and put the curd in a large cheesecloth on a level butter-worker. If you have not a butter-worker, devise a wooden rack for the bottom of a large tin and spread the cloth over it. The curd must be well stirred for ten or fifteen minutes to allow the whey to escape.

FARM DAIRYING

SALTING

The curd may now be salted at the rate of one ounce to every twenty-five pounds of milk. Sprinkle the salt over the curd; stir well and allow it to stand ten or fifteen minutes.

HOOPING

One cannot get along without a cheese hoop. It may be made of wood or heavy tin, but must be round, straight, strong, and the ends clean cut without any rim. A nice size is 6 inches in diameter by 12 inches high; this will press a cheese weighing from six to ten pounds. The circle or follower of wood placed in the hoop on top of the curd must fit well, or the cheese will have shoulders.

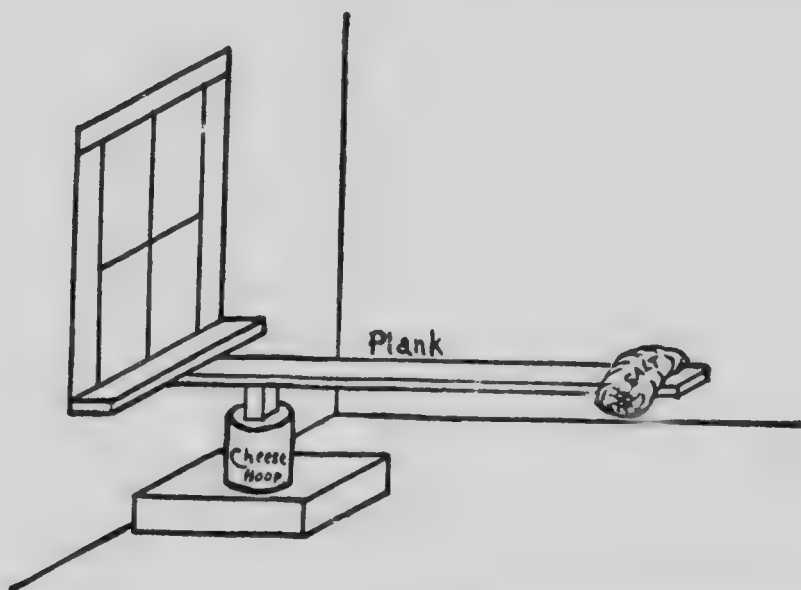
A bandager may be made of ordinary tin, and should fit closely inside the hoop and be four inches higher than the hoop, but must have no wire rim around it.

Cut a piece of cheesecloth the length of the bandager and the width around it. Sew up the sides and run a thread around one end, and slip it on the outside of the bandager.

Place the hoop on a board in a tin pan; put a square of cotton, wet in the hot water, on top of the hoop, then place on the prepared bandager

FARM DAIRYING

and shove it to the bottom. Put in the salted curd; press down well with the hand; pull up the bandager, and the cheese is inside the cheesecloth in the hoop; lay on a square of wet cotton, and put on the follower.



DEVICE EMPLOYED BY THE AUTHOR AND HER SISTER FOR
PRESSING FIRST-PRIZE HOME-MADE CHEESE

PRESSING

Many contrivances may be used to supply the pressure; a cider press answers. I use the old-fashioned fulcrum and lever press, as with it the pressure is continuous. This press is easily constructed. Get a strong board or a piece of scant-

FARM DAIRYING

ling, 8 or 10 feet long. Place it under a ledge, put the cheese on the floor or on a bench near the ledge, and put a small block or board on the centre of the cheese for the scantling to rest on. Place a heavy weight — about fifty pounds — on the end of the scantling. It is well not to put all the weight on at once but to increase it gradually.

DRESSING THE CHEESE

The next morning the cheese should be taken from the hoop, dampened with hot water on the outside, the bandage pulled up and trimmed so as to allow it to extend half an inch over the ends. Cut a circle of stiffened cheesecloth, the size of the top, place carefully on the cheese, cover with a square of wet cotton, place the hoop on top, and force the cheese into it.

Finish off the other end in the same way. Put again to press till the next day. Take from the hoop and place in a cool cellar, turning it upside down every day for a month, and after that occasionally.

Do not worry if it moulds. The mould will be on the outside only, and should be well washed off before the cheese is cut. At the end of two months it should be ready for eating, but is better if kept for five or six months.

FARM DAIRYING

If the milk is sweet and good, and the necessary care be taken in the manufacture, this method produces a rich, meaty cheese, much liked by every one. The cheese resembles a nice Canadian Cheddar, but is more open and softer in texture.

COMPOSITION OF A CHEDDAR CHEESE

Fat	.	.	.	36	per cent
Casein and Albumen	.			26	" "
Ash (mainly salt)	.			4	" "
Water	.	.	.	34	" "
				<hr/>	
Total	.	.	.	100	" "

CHAPTER XLIII

SOFT-CHEESE-MAKING

IN European countries there are many varieties of soft cheese made. These cheeses are gaining favor on this continent. Some of the varieties are easily made at home, and make a pleasant change.

COTTAGE OR DUTCH CHEESE

Let fresh milk stand in a warm clean place (100°) until the milk sours and the curd separates from the whey. Turn the curd into a coarse cotton bag or towel and hang to drain in a moderately cool place for twenty-four hours or until the curd is free from whey. Add salt and cream to suit the taste and mould with the hands into small balls, or press into a dish.

Thick sour milk may be set over warm water until the whey separates. The water must not be too hot, or the curds will be hard and dry. Drain and prepare as already described.

Cottage cheese may be eaten as it is, or with cream and sugar; with cream, pepper, and salt; or with stewed fruits. A good cottage cheese should have a soft, smooth texture, being neither

FARM DAIRYING

mushy nor dry. The flavor should be that of mildly sour milk, with an entire absence of a bitter taste or objectionable flavors.

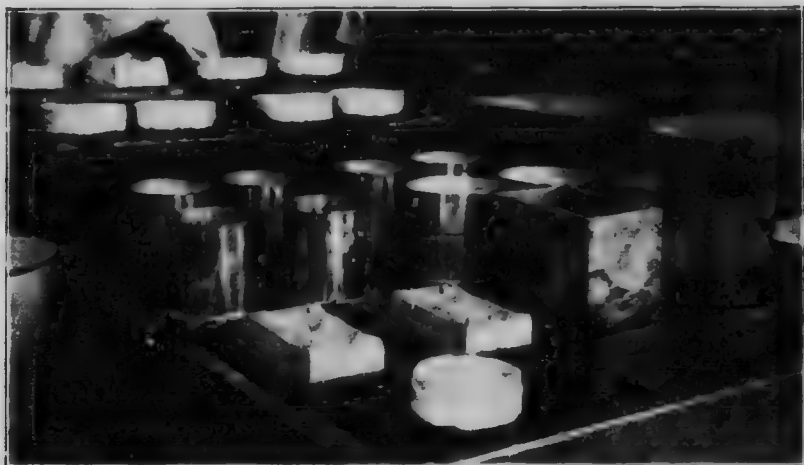
DOUBLE-CREAM CHEESE

This cheese is exceptionally rich in fat; is of a very smooth texture; and is delicious, spread on crackers or eaten with bread.

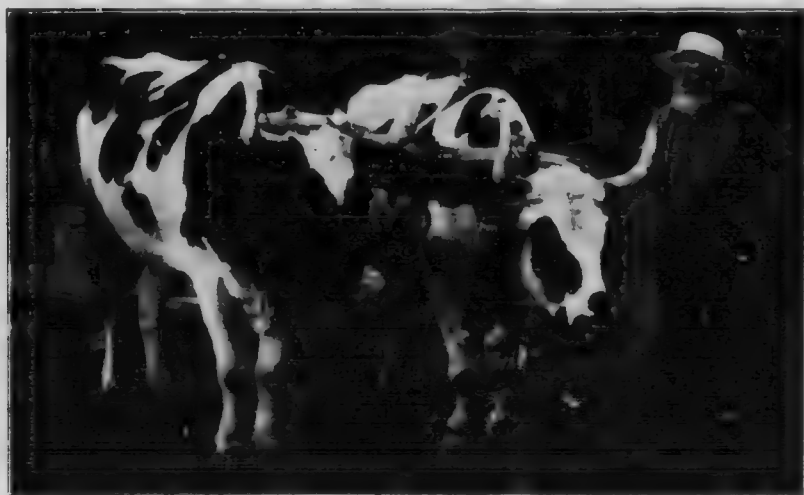
The cream may be sweet or very slightly sour. Heat to a temperature of 60° to 65°. To 20 pounds (2 gallons) of cream add one dram of rennet (a teaspoonful) diluted in a little water. Stir well. In about four hours the cream will have coagulated. Pour it into dry cloths placed over bowls. Then hang up to drain in a cool, draughty place. The cloths should be of close duck and should be dry. It is advisable not to put very much curd in one cloth, as it is liable to develop too much acid before draining is complete.

In two or three hours open the cloth and scrape down the sides. Hang up again. Repeat the scraping at intervals of about three hours, till the cheese is firm enough to mould. The draining may be hastened by scraping down more frequently.

When the cheese is ready to mould it should be of a stiff, putty consistency, but not sticky. Salt



SOFT CHEESES, FINISHED AND IN PROCESS OF MAKING



THE POWER OF PIONEER DAYS

FARM DAIRYING

is now added at the rate of one ounce of salt to four pounds of cheese. Work the salt in with a knife or spatula, and the cheese is ready to mould. The tin or mould for cream cheese is usually oblong in shape — $3\frac{1}{2} \times 1\frac{1}{2} \times 2$ inches. Line the mould with waxed butter-paper and press the cheese in with a knife or spatula. When full, fold over the ends of the paper and shake out the mould of cheese.

The cheeses when moulded are ready for immediate use. If kept in a cool place they remain good for a week or two. Cream cheese contains about 31 per cent water, 63 per cent fat, 5 per cent proteids, 1 per cent ash.

GERVAIS*

This cheese resembles soft double-cream cheese but not so rich — similar to rich, smooth cottage cheese.

Take 3 pints of fresh morning's milk and $1\frac{1}{2}$ pints of cream of about 20 per cent fat. Heat it to 65° . Take eight drops of rennet, and if you have it, two drops of cheese color. Dilute these in a little cold water and stir very thoroughly into the milk. Cover over the dish and keep at as near 65° as possible.

* Pronounced ger-va'.

FARM DAIRYING

In about four hours, or when a nice, firm coagulation has taken place, wet a heavy linen huckaback towel, place it over a dish, and carefully ladle out the curd. Gather up the four corners of the towel and tie rather loosely. Hang to drain. Two or three times during the day untie the towel and scrape down the curd to hasten the drainage. Next morning scrape down again and mix in a little salt. After a little while fill into a small mould, which has been lined with white blotting paper or writing paper. Use a thin-bladed knife to press the cheese in the mould. After it is filled, slip out the cheese and use the mould again until all the curd is moulded. The usual-sized mould is 2 inches in diameter by $2\frac{1}{2}$ inches high. A round spice or baking-powder tin answers.

The cheeses are fit for eating as soon as finished. They will keep for a week or more in a cool place.

CAMBRIDGE CHEESE

Heat 1 gallon of new milk in an enamelled pail or dish to 95°. Add to it 3 drops of cheese color and 15 drops of rennet mixed in a little cold water. Stir for five minutes. Let stand for five minutes. Then stir the surface a little to prevent the cream from rising; cover the pail with a cloth and leave it undisturbed. At the end of an hour or an hour

FARM DAIRYING

and a quarter, coagulation should have taken place and the curd should be about as firm as a baked custard. Try it by inserting the finger and notice how the curd breaks over it.

Wooden moulds are usually used for these cheeses, but tin biscuit boxes, with the bottoms removed, and with nail holes punched from the inside out, on the sides, to act as drains, might be used. The wooden moulds are 7 x 6 x 4 inches, with no bottom in them. Small holes, an inch apart, are bored in the sides. These moulds are scalded, placed on a mat made of straws sewed together, and put on a small board. The mat acts as a drain.

When the curd is sufficiently firm, carefully ladle out enough to cover the bottom, then add a little more at intervals of fifteen minutes, till all is ladled into the moulds. A gallon makes two cheeses. When they shrink from the sides and are comparatively firm and dry remove the moulds. They are now ready for use. It usually takes two days for them to drain in the moulds.

No salt is put on these cheeses, although some people prefer to sprinkle a little over them.

The manufacture of these cheeses is well adapted to farm dairying, and they should find ready sale on the market.

FARM DAIRYING

BONDON CHEESE

This cheese is made from a mixture of two-thirds sweet skim-milk and one-third good butter-milk. Mix together and keep at a temperature of about 80° until it thickens, then ladle into a huckaback towel. When well drained, open out and scrape down the curd. Tie up again and repeat the scraping occasionally until the curd is firm, then slightly salt and press into a bowl, or mould into small balls. A very cheap, highly nutritious food.

CHAPTER XLIV

DAINTY AND POPULAR MILK AND CREAM DISHES

DEVONSHIRE CREAM, OR CLOTTED CREAM

THIS cream is considered a rare treat with apple pie or any kind of cooked fruit. It is recommended by physicians as an excellent fatty food and might be freely used, in place of cod-liver oil, by many invalids. It contains from 50 to 60 per cent of fat in a finely emulsified condition, rendering it easy of digestion.

To make this cream, strain milk into a large shallow pan to the depth of four or five inches. Let stand in a cool place undisturbed twelve hours in summer and twenty-four in winter. Then carefully place the pan over a pot of hot water, or on the back of the stove. When the cream forms a ring around the pan, and is wrinkled on the top, it is done. The heating should take at least half an hour and the temperature should be up to 180° in order to develop the desired scalded flavor. It is usual to let it stand twelve hours before skimming.

Devonshire cream should be sold by the pound.

FARM DAIRYING

A gallon and a half of good milk makes one pound of cream.

WHIPPED CREAM

Many complain that they cannot get cream to whip well. Three things are necessary:

1. Have the cream rich—25 per cent fat or over.
2. Have the cream at least a day old. Separator cream will not whip if just fresh. Hold it sweet for a day or two and it will whip beautifully.
3. The cream must be cold, otherwise it is apt to churn into butter.

Set the vessel in which you are whipping the cream, in a dish of ice or snow, or cold water, and beat the cream in a cool air.

There are few things a little whipped cream will not improve, and it does not take much cream to make a large dish of whipped cream.

JUNKET (CURDS AND WHEY)

Junket is an old-fashioned, wholesome milk dish. In one farm home I visited, it was their regular Sunday dessert, made from the fresh morning's milk and set in a cool place till needed for dinner.

1 quart of rich milk.

$\frac{1}{4}$ cup white sugar.

FARM DAIRYING

1 teaspoonful vanilla.

1 junket tablet, or a few drops of rennet.

A little powdered sugar and cinnamon.

Crush the junket tablet and dissolve in one table-spoonful of cold water. Heat the milk and sugar, stirring constantly until it reaches 100° , or blood heat. Add the flavoring and dissolved tablet. Stir well and pour into a serving dish or sherbet cups. Let stand in a warm place until the milk sets. Then remove without jarring to a cool place.

Just before serving sprinkle the top with powdered sugar and cinnamon mixed, and eat with cream. It is nice covered with Devonshire cream, or piled high with whipped cream. Sufficient caramel to make a delicate brown color, or an ounce of melted chocolate, stirred into the milk before adding the rennet, makes a pleasing change.

ICE CREAM

People on the farms are not much given to making ice cream, yet it is an inexpensive, delightful, easily made treat for a hot day, or to serve either in summer or winter to company.

General rules for freezing follow: Crush the ice by pounding it in a sack. Have the ice fine. Wet snow may be used in winter. Use plenty of coarse salt in freezing, one measure of salt to

FARM DAIRYING

three measures of ice. Do not run off the brine as it is that which is the coldest and does the freezing. Keep adding ice and salt when necessary.

Have the cream thoroughly chilled before starting to turn the freezer, otherwise the cream may partially churn. Turn slowly for a while at first. When the cream begins to freeze, turn more rapidly. This causes it to swell and increase in bulk. Never stop the freezer after it is once started until the cream is frozen. Cream a day or two old swells more than fresh cream. If cream freezes too quickly it is apt to be icy and less velvety and fine-grained.

The following is a standard recipe for ice cream:

- 1 quart of thin cream, 20 to 23 per cent fat.
- 1 cup of white sugar.
- 2 teaspoonfuls of flavoring.
- 1 egg.

The cream should not be too rich. Cream with 20 per cent fat makes a good quality. It may be scalded or not—preferably scalded. Dissolve the sugar in the hot cream. When cold, add the flavoring and beaten egg, then freeze. The freezer should not be more than half full at starting. Stop freezing when the cream falls from the

FARM DAIRYING

spoon like a stiff batter. To continue after this stage spoils it. The dasher should be removed, a cork put in the top of the lid, part of the brine drawn off, the freezer filled with ice and salt and the same put over the top of the can, and then well covered with paper and old carpet, till needed.

If more than one freezerful of cream be desired, turn the frozen cream out into a pail or tin which has a tight cover, place this in a larger pail, and pack with ice and salt. A large quantity may be made in this way with one freezer. Be most careful not to get any of the brine in the cream.

A little hot water thrown around the freezer can allows the cream to empty more freely into the packing can.

Ice cream is eaten in perfection only when prepared and left to ripen for some hours before being served.

In making fruit cream of strawberries, raspberries, peaches, bananas, etc., mash the fruit and add sufficient sugar and let stand. When the standard ice cream is almost frozen add the sweetened fruit to it, and continue the freezing. Chopped nuts, candied fruits, preserved ginger, or melted chocolate, may be used to give variety from time to time.

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MOUSSE

To make mousse does not take as much time as to make ice cream, and does not require a freezer.

Whip good rich cream until it is stiff. Sweeten and flavor it to suit the taste. Turn into a mould or pail and pack with chopped ice and salt, using as much salt as ice. Be sure not to let the brine get into the cream. A strip of cotton dipped in hot suet or melted butter and placed around the lid after it is on prevents brine from entering. Cover well with a blanket and let stand from two to four hours. Chopped walnuts or candied fruits, figs, or dates, may be added to the cream.

A tin baking-powder or coffee can is splendid to freeze mousse in, and makes a pretty mould if dipped for a moment in hot water before the mousse is turned out on a fancy plate.

Mousse is so easy to make, is so delicious, and so much like ice cream, I should like some of the girls in the farm homes to try it. Use plenty of salt, or it will not freeze. I know this from experience.

WHITE, OR ANGEL, PARFAIT

1 pint of very rich cream.

1 cup sugar.

1/3 cup of boiling water.

FARM DAIRYING

Whites of two eggs.

2 teaspoonfuls vanilla.

Boil the sugar and water till the syrup threads, and pour it in a fine stream on the stiffly beaten egg whites, beating constantly. When cold, fold in the cream beaten solid. Add flavoring, turn into a mould, and let stand four hours packed in equal parts of ice and salt.

Same directions as for freezing mousse.

LEMON MILK SHERBET (VERY NICE AND CHEAP)

4 cups of good milk.

1 ½ cups of white sugar.

Juice of 3 lemons.

Mix juice and sugar, add chilled milk slowly, stirring constantly. Freeze the same as ordinary ice cream.

CHAPTER XLV

FOOD VALUE OF SKIM-MILK AND BUTTERMILK

WHOLE milk is recognized by all to be a good nourishing food — one quart equal to twelve ounces of beefsteak or one quart of oysters in food value; but too many people place little or no value on skim-milk, especially that from the separator. This is a very erroneous idea. In the process of skimming, the fat, the heat and fat producing constituent only, has been removed. The muscle and bone forming elements and the sugar still remain.

Skim-milk is more valuable as a food than cream. A child would have good chances of living if fed on skim-milk, but if limited to cream alone, would probably die.

The use of skim-milk in the household should be greatly extended. More milk puddings, soups, and custards should be made from it.

Skim-milk, thoroughly chilled in summer and heated in winter, should take the place of tea and coffee for the young people at meal times.

Hot bread-and-milk, and buttered toast covered with hot milk, are excellent supper dishes, but are rarely found on the farm table. Hot skim-milk,

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sweetened, with a little good coffee poured into it, makes a delicious breakfast beverage.

It should be made possible in all our towns and cities to buy skim-milk, and the housewife should not stint herself in its use.

Usually skim-milk sells for half the price of whole milk. It is a very cheap, very nutritious food. Skim-milk furnishes protein, the muscle-forming element in our food, about four times as cheaply as beef.

BUTTERMILK

Buttermilk is a beverage of deserving and growing popularity. It is rich in protein and is very easily digested, owing to the casein being in a finely flocculent condition. Doctors are prescribing a free use of buttermilk as a corrective for many forms of disease. The lactic acid germ is said to be antagonistic to the death germ, consequently people who use sour milk or buttermilk freely may reasonably hope to lengthen their lives.

The time is just at hand when there will be such a demand for good buttermilk that it will prove a most profitable by-product of the dairy. In fact, already sour skim-milk is churned to supplement the deficiency in the supply of buttermilk. This wholesome beverage is largely taking the place of beer in hotels and restaurants.

CHAPTER XLVI

PROFITABLE USE OF THE BY-PRODUCTS OF THE DAIRY

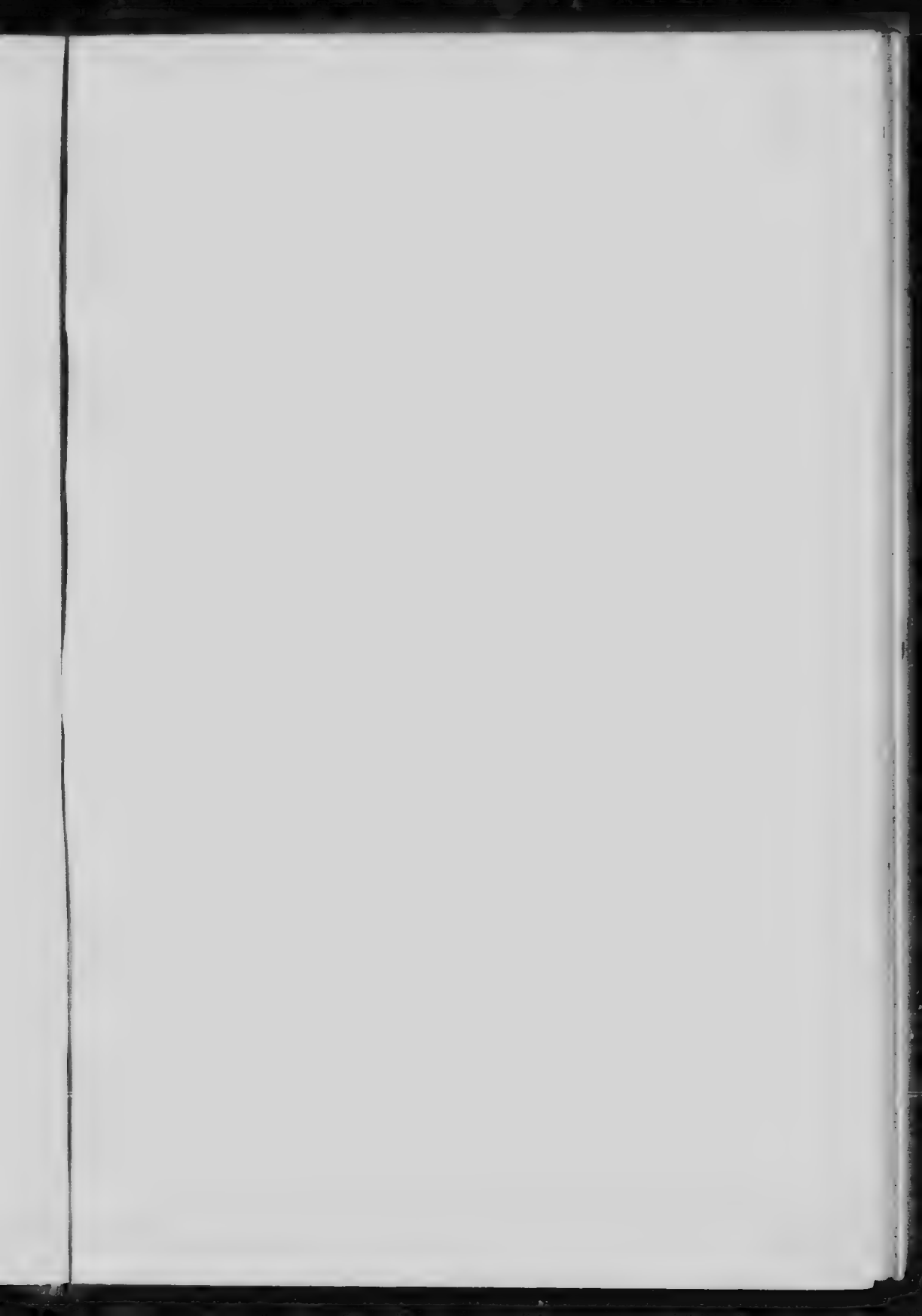
"'T is well in every case, you know,
To have two strings unto your bow;
Some clucking hens and a brooding sow
Increase the profits from the dairy cow."

SKIM-MILK FOR PIGS

A LARGE increase in profits may be derived from the dairy by putting to the best use the skim-milk, buttermilk, and whey. Every dairy farm should have a pen of good pigs and a flock of pure-bred chickens to utilize these by-products.

Skim-milk is considered one of the best of foods for pigs of all ages. It is not only valuable in itself, but it helps to digest other foods, and so makes them more valuable. It makes a firm, fine quality of bacon. About a gallon and a half a day for a one-hundred-pound pig will bring economical results, or feeding at the ratio of three pounds of milk to one of meal. The ratio may be broadened if skim-milk is plentiful, but to give pigs all the skim-milk they can drink is extravagant and wasteful.

Buttermilk, when not diluted with water, has





PROFITABLE CONSUMERS OF THE BY-PRODUCTS
OF THE DAIRY

FARM DAIRYING

practically the same food value as skim-milk for pigs.

Whey, while not good for young pigs, when mixed with meal for pigs of three months or older, gives good results.

SKIM-MILK FOR COWS

Skim-milk is said to be excellent for cows if they can be induced to drink it, or it may be mixed with their food. It is said to be worth from thirty to forty cents per hundred pounds in food value when so used.

SKIM-MILK FOR CHICKENS

Many chickens on the farm do not know the taste of skim-milk, and yet it is one of the very best foods for both young and old fowl. The casein, or curdy part of the milk, largely supplies the protein necessary for laying hens, while for table fowl there is nothing superior to milk for making white, juicy, delicate flesh.

The milk may be either sour or sweet, and may be given as a drink or mixed with the meal, or both.

Sour skim-milk or buttermilk, fed to fowls confined to limited range, keeps them in health. The acid of the milk supplies the lack of vegetable acid they would get if running at large, and moreover, it aids digestion.

FARM DAIRYING

Poultry-men keep a cow or two to have milk for their chickens. Why should not dairymen keep good hens to use profitably some of the skim-milk from their cows?

CHAPTER XLVII

THE VALUE OF MANURE AND THE USE OF ABSORBENTS

NO other fertilizer exerts such a powerful chemical and mechanical effect, and no other can be applied to all sorts of land with such positive certainty of good results, as stable manure. Its power is also peculiarly lasting. These merits are quite sufficient to account for the high esteem in which it is held by the farmer, and yet there is reason to doubt if he does realize its value, when one sees the careless way in which much of it is handled.

Five-eighths of the plant food in the manure from cows is in the liquid part. Every care should be taken to save the urine. A few dollars spent in absorbents will bring back many dollars in increased crops.

A great loss is sustained by having the manure in an open barnyard, exposed to snow and rain.

There are only two ways manure can lose in value, namely, by fermentation and by washing.

The best way to conserve its fertility is to distribute it daily on the land. Getting it out in this way in the winter is a great saving of labor in the

FARM DAIRYING

busy season. If this be not possible, it should be stored in a covered manure shed with a sunk cement floor.

The bulk of the manure should be applied to the corn and root land. Keep it near the surface and work it with the top soil into a fine seed bed.

A year's manure from a well fed cow has in it from thirty to thirty-five dollars' worth of fertilizing material, depending on the richness of her ration. The cow should be credited with this.

Manure from milking cows and young growing animals contains from 50 to 75 per cent of the fertilizing constituents contained in the food. As far as possible all the crops raised should be consumed on the farm, and the manure properly cared for and returned to the soil. Dairying is particularly adapted to the building up and the sustaining of soil fertility.

When selecting absorbents to use for bedding in the stable, it is well to consider the manurial value of the materials. Sawdust is a clean and good absorbent and considerably used in stables, but carries in itself very little fertilizing material. On the other hand, oat and wheat straw quickly rot, and are worth to the land about two dollars and fifty cents per ton; if the straw is cut it is a still better absorbent and the manure is much eas-

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ier worked into the soil. Forest leaves are often used as bedding, and go to enrich the land.

Land plaster is one of the best absorbents. It fixes the ammonia and is a good fertilizer.

CHAPTER XLVIII

THE BABCOCK MILK TEST

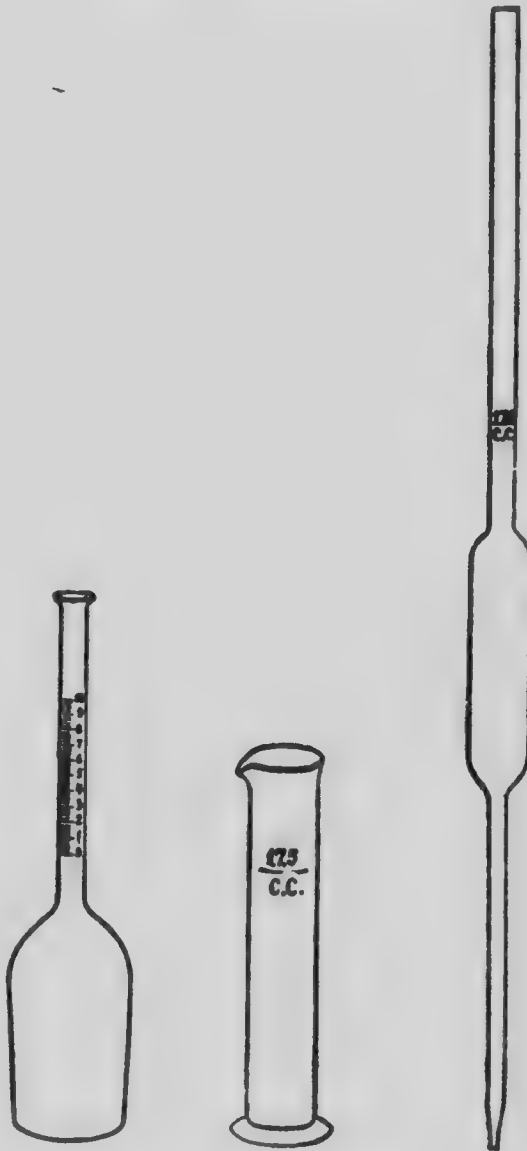
THE Babcock Tester is like a mighty search-light thrown on the dairy industry. With impartial accuracy it reveals the profitable and unprofitable cows. It condemns or praises the work of the separator. It reveals the loss of fat in whey and buttermilk, and it puts a check on dishonesty by having milk and cream sold on the value of their fat content. No dairyman should feel his equipment complete without one. A four-bottle Babcock tester, complete, can be had for five or six dollars.

The work of the Cow-Testing Association is so rapidly extending that a dairyman of any pretensions will soon be ashamed to admit that he does not know the individual productiveness of his herd.

Milk-testing is not a complicated or tedious thing to do. A careful boy or girl fourteen or fifteen years old can soon learn to make correct tests. There is no better way of getting the children interested in the cows.

The Babcock Test is a simple, quick, cheap, and

FARM DAIRYING



GLASSWARE FOR THE BABCOCK FAT TEST

FARM DAIRYING

reliable test for determining the percentage of fat in milk, cream, etc.

GENERAL RULES FOR MAKING THE TEST

All the glassware must be perfectly clean. Wash it in a strong solution of soda and rinse it well afterwards.

Have a representative sample of the milk or cream to be tested. People have brought me a little milk from one teat to be tested. It must be from the entire milk, well mixed. Samples of cream, skim-milk, buttermilk, and whey, must be taken from the bulk after being well stirred from the bottom to the top. At the time of making the test, the sample should be poured from one vessel to another, so as to obtain a thorough and even mixture. It should be at a temperature of between 60° and 70°.

A 17.6-cubic-centimetre (c.c.) pipette is used to take the measure of milk required. Insert the small end in the milk, and the other end in the mouth, draw up the air and the milk rises in the tube. When the pipette is filled with milk, quickly place the index finger of the right hand over the top of the pipette. Hold the pipette on a level with the eye and slowly allow a little air to get in by slightly easing the pressure of the finger. The

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milk will run out in proportion to the air admitted. When the milk exactly reaches the line indicating the proper amount for a test, quickly press down the finger.

A test is of little or no value unless it is in every way accurate.

Place the point of the pipette in the neck of the bottle, but do not shove it in tightly; remove the finger from the end, and the milk runs into the bottle. Blow, to get the last drop.

Pour into the acid measure 17.5 cc. of commercial sulphuric acid with a specific gravity of 1.82. When adding it to the milk, hold the test bottle on a slant so as to allow the acid to run down the neck and under the milk, and not fall directly on top of it.

By giving the bottle a gentle rotary motion, thoroughly mix the acid and the milk. Never point the neck of the bottle toward your own face or in the direction of any one else, as a violent or careless shaking may cause the contents to spurt from the bottle. The contents of the bottle get very hot by the action of the acid. The acid dissolves all the constituents of the milk, except the fat, which it heats and liberates. Sulphuric acid is dangerous. It eats holes in cloth and burns the skin. When it is handled with care there is no cause for

FARM DAIRYING

alarm. If it get on the hands or clothes, immediately wash with water. Ammonia checks its action on cloth or leather and restores the color. The acid must be kept in glass or stone jars or bottles, and always kept corked, as it weakens in strength if exposed to the air.

When each sample to be tested is taken as described, put the bottles in the machine, placing them so as to maintain the balance, and whirl for four or five minutes. Stop the machine and add sufficient hot water at a temperature of 140° to float the fat into the marked scale space, on the neck of the bottle. Rotate the machine again for two minutes, then place the bottles in water at about 140° , having the water reach as high as the top of the fat in the neck, and read the fat column, when at that temperature.

It is well to use a pair of dividers or compasses for measuring the fat. The points of the dividers should be placed at the extreme upper and lower limits of the fat column. Then carefully place the one point of the dividers at the zero mark of the scale; the division at which the other point touches will show the percentage of fat in the sample tested.

The small divisions of the scale read two-tenths of one per cent, the large divisions equal one per

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cent, on the whole-milk bottles. Therefore, if the fat covers three large spaces and four small ones, the milk tested contains three and eight-tenths pounds of fat per hundred pounds of milk, or is said to have 3.8 per cent fat.

TESTING CREAM

Cream test-bottles are graduated to read as high as 30, 40, or 50 per cent fat, and are made with a large neck.

Use an 18 c.c. pipette for measuring the cream. Rinse the pipette with a little water to get out the full complement of cream. After mixing the cream and acid, add the hot water before whirling, and whirl for five minutes. Place the bottles in hot water before reading.

Each division of the scale reads one-half or one per cent, according to the marking.

The proper amount of cream, or milk, etc., for a test is 18 grams. The pipette is fairly accurate in delivering this weight, but in case of very rich or gassy cream it is impossible to be sure that the volume measured will weigh 18 grams. For this reason in many creameries the test samples are weighed on scales manufactured for this purpose.

TESTING SKIM-MILK, BUTTERMILK, WHEY

Owing to the small percentage of fat in these

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products, to get accurate tests, double-necked test bottles should be used.

The amount is taken in a 17.6 c.c. pipette and tested in the usual way.

The milk has to be delivered slowly into the larger neck or it bubbles out.

The scale on the neck reads to one-hundredth of one per cent. One large division reads five-hundredths, or .05 per cent fat.

COMPOSITE SAMPLES; TESTING A HERD

It is not always convenient, nor is it necessary, to test daily when a yearly record is being kept of a herd, or when milk or cream is delivered at a factory.

We will suppose a herd test is to be kept. There should be a pint bottle with a long tight fitting cork, for each cow. The cow's name or number should be plainly written on a label which is gummed well on the bottle, then given two coats of shellac so as not to have the label come off when the bottle is washed.

The bottles should be placed on a convenient shelf in the milk-room separated from the stable. Hanging near should be a pair of spring scales set to record the net weight of milk. (The milk pails should be all the same weight.)



HANDY WEIGHING AND SAMPLING APPARATUS FOR
TESTING COWS

NOTE THE DROP SHELF ON WHICH THE RECORD SHEET IS TACKED

FARM DAIRYING

On a board by the shelf should be tacked a record sheet to mark the pounds of milk at each milking.

To keep the milk from curdling in the test bottles, a preservative is necessary. The one commonly used is seven parts bichromate of potash to one part of corrosive sublimate, but three parts of the former to one of the latter give better results. This is poisonous, but as it turns the milk a decided yellow no one is apt to drink it. Put about as much of this powder as can be lifted on a ten cent piece into each bottle. This amount of preservative will keep the sample good from two to four weeks, according to the heat of the weather. If very warm use more. Avoid too much, as it spoils the test, giving burnt readings. Preservative tablets may be procured and are more convenient than the powder.

The sample is taken night and morning by means of a long-handled one-ounce dipper, and precaution must be taken to pour the milk so measured into the proper bottle.

When the test is only made fortnightly or monthly, the samples must be taken for two or three days, as the fat content may vary from day to day, as well as in the morning's and evening's milk.

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To prepare composite samples for testing, set the bottles in water at 110 degrees to melt any cream on the sides of the bottles. Mix well by pouring from one vessel to another. Take the samples as usual but cool to about 60 degrees before adding the acid. Use slightly less acid than for ordinary testing.

To find the pounds of fat produced during the period the test has covered, multiply the test by the pounds of milk given during that time and divide by one hundred.

To find the approximate number of pounds of butter, divide the total pounds of fat by six, and add the result to the pounds of fat, and it will equal the pounds of butter.

Total lbs. milk given	}	900 x 3.8		= 34.2 lbs. fat.
during month . 900				
Average milk test				
during month 3.8%				
Total lbs. fat			100	
				34.2
1-6 of total lbs. fat			34.2	
				5.7
				5
Calculated yield of butter				39.9 lbs.

FARM DAIRYING

BURNT OR CLOUDY READINGS

The cause may be —

1. The use of too much or too strong acid.
Lessen the amount.
2. Milk or acid too hot. The higher the temperature of the milk or the acid, the less acid required.
3. Allowing the acid to drop directly on the milk.
4. Allowing the sample to stand too long after adding the acid, before mixing.

LIGHT COLORED READINGS OR FLOATING PARTICLES OF CURD

The cause may be —

1. The use of too little or too weak acid.
2. Milk or acid too cold.
3. Insufficient mixing of acid and milk.
4. Lack of required speed or time in whirling.

Foam on top of the fat column is usually due to hard water being added. It is better to use soft water, or add a little sulphuric acid to the hard water.

If the sample of milk has curdled, put a little concentrated lye in it and mix till the curd has dissolved.

Should the sample become churned, set it in water at 110 degrees and when the fat is melted,

FARM DAIRYING

pour from one vessel to another and immediately put the required amount in the test bottle; but do not add the acid till the temperature is reduced. The test is never as reliable.

THE LACTOMETER

The lactometer is an instrument to determine the specific gravity of milk. The Quevenne lactometer is in most general use. It consists of a hollow glass cylinder weighted by means of mercury or fine shot, so that when floated in milk it takes an upright position. From the upper end of the cylinder there is a narrow stem containing a graduated scale to show the specific gravity, and also a thermometer column.

The term specific gravity means the weight of a solid or liquid compared with an equal volume of water at 39.2° F. Average whole milk has a specific gravity of 1.032, which indicates that milk is .032 heavier than water.

When the lactometer is placed in milk it displaces a portion of the liquid and the scale on the stem of



LACTOMETER

FARM DAIRYING

the lactometer shows the specific gravity of that milk at the temperature indicated by the thermometer. The lighter the milk the farther the lactometer sinks, therefore when water is added to milk its presence is soon detected because it makes the lactometer sink lower, owing to the water making the milk lighter in weight. When cream is removed, the opposite effect is produced. By using the lactometer in conjunction with the Babcock Tester, the percentage of solids-not-fat and the percentage of water in milk may be determined.

Milk inspectors rely on the lactometer to detect whether milk has been watered or skimmed, or both, and to what extent.

CHAPTER XLIX

ACIDIMETER — A TEST FOR ACID IN MILK

IN butter, and even to a greater extent in cheese making, the necessity for knowing the exact amount of acid at the different stages of manufacture, has introduced the simple, quick, cheap method known as the alkaline test, which gives the percentage of acid present in the sample tested.

The principle of the test is based on the fact that a certain amount of an alkaline solution of a known standard strength (.111 normal) will neutralize a certain amount of acid; therefore, if it takes so much of the solution to neutralize the acid in a given quantity of milk, cream, or whey, it is easy to find the percentage of acid present. But the method and scale are so arranged as to give the percentage without any calculating.

The solution is made from caustic soda. The outfit and solution can be bought from any dairy supply company. The outfit and a gallon of the solution costs about \$4.00.

This test has made the work of cheese-making very much more accurate, and the product more uniform. It is used in creameries with equal suc-

FARM DAIRYING

cess. The acid test could be made valuable for the retail milk trade.

THE HART CASEIN TESTER

This tester is used for determining the casein content of milk, and when it is more generally known and used is likely to prove valuable to the cheese branch of the dairy industry.

It is not a difficult test to make, does not take long, nor does it require much milk.

It determines quite accurately the percentage of casein in the milk, as comparisons with chemical analysis have proved.

Without casein it is impossible to make cheese. It seems but right that the amount of its presence in the milk should be recognized as well as that of the milk-fat, and where milk is sold for cheese-making purposes these two constituents taken together should determine its value.

CHAPTER L

THE ICE-HOUSE

NO dairy farm should be without an ice-house, if it is at all possible to secure ice.

No matter how the milk is to be disposed of, ice is at some time likely to be required.

For the retail trade, ice means quickly cooled milk, which remains sweet much longer. For the cheese factory, ice means no over-ripe milk to be returned. For the creamery, ice means sweet cream delivered. For the farm-home people, ice provides a means of preserving perishable food-stuffs.

Why should not the farmer's wife have a large, handy refrigerator, as well as the town lady, and not have to constantly run up and down the cellar stairs?

A well-built ice-house is desirable, but I have seen ice kept just under a big pile of sawdust without further protection.

A cheap ice-house is quickly constructed. Rough lumber nailed on studding strongly secured, answers. The roof must be so arranged as to allow for ventilation, otherwise the heat would melt the ice.

FARM DAIRYING

A small room at the south end for storing sawdust is convenient. It also protects the ice at that end from the heat.

Whitewashing the ice-house is also a protection from the sun's rays, as the white reflects the heat. Avoid opening the ice-house in the heat of the day. Do not leave the door open longer than necessary.

There must be some means of drainage, a layer of old rails does — anything to prevent the accumulation of water under the ice.

There should be from 15 to 20 inches of sawdust between the ice and the outside wall, and the same over the top of the ice.

If there be no water near from which to get ice, you can make ice blocks on your own farm, by putting the water in pans and letting it freeze. Ten blocks of ice 18 x 36 x 10 weigh a ton.

About two tons of ice per cow should be stored.

CHAPTER LI

FLIES — FLIES ON CATTLE

FLIES are a terrible torment at times and have much to do with the lessening of the milk-flow. The cows are so worried and kept so busy fighting the flies that they lose much of the time they should be feeding, and it is their semi-starved condition that largely causes the shrinkage in flesh and milk.

Something should be done to rid the cows of this fly pest.

The following mixture has been found as effective as, and less expensive than, many of the fly remedies on the market.

- 1 gallon fish or seal oil or old grease of any kind.
- 1 pint coal oil (kerosene).
- 2 ounces (4 tablespoonfuls) crude carbolic acid.

Mix well together and apply with a cloth or spray to all parts except the udder. Always put it on after milking to avoid the strong odor getting into the milk. In dry weather one application a week is usually sufficient. If the cows are out in a heavy rain, it will be necessary to go over them again.

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Another fly remedy is: — 10 parts of lard, or other grease, to one part of pine tar. Mix well and apply with a brush or cloth once or twice a week to the parts most attacked. This is splendid as a relief from the horn fly.

If the flies make the cows restless during milking, so that they will not stand, a cotton blanket thrown over them at that time is a great help.

It is a good plan to darken the stable during the day, and to have the windows screened.

To prevent the flies that are on the cows from going into the stable with them, arrange some evergreen boughs, brush, brooms, or sacking at the entrance. As the cows pass through this, many flies are brushed off and remain outside.

THE HOUSE FLY

The house fly has always been a troublesome nuisance, but now it is looked upon as a very potent agent in spreading such dangerous diseases as typhoid fever, cholera infantum, summer complaint, etc.

Flies are such indiscriminating scavengers; in their migrations they visit everything both hidden and revealed. When we consider this, the thought of them walking over our food or taking a sail in the milk pitcher is far from pleasant, and when

FARM DAIRYING

bacteriologists inform us that the average fly carries around on its body $1\frac{1}{4}$ million germs, surely we should feel a just cause for grave alarm.



THE COMMON HOUSE FLY, THE MOST
DANGEROUS ANIMAL ON EARTH

Flies breed profusely in filth. They reproduce themselves in countless thousands in the open manure pile, in the dirty pig pen or yard, in places where the household slops are regularly deposited, in the vault of the outhouse, in vegetable garbage, any place where there is decomposing material.

By storing the manure in a dark shed, or by spreading it on the fields, keeping calf pens and pig yards, etc., as clean as possible, and by providing better sanitary conditions, the troublesome fly can be greatly reduced.

To sprinkle all possible breeding places with kerosene or cover with lime, every few days, is strongly recommended.

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Dr. Howard, entomologist of the United States Department of Agriculture, has found that each female lays about 120 eggs, which hatch in eight hours, the larva period lasting five days and the pupa five days, making the total time needed for the development of a generation just ten days. A big fly has always been a big fly, and a little fly can never grow to be a big fly — and just as soon as they have emerged from the pupa stage they can begin laying eggs. Under favorable conditions a single pair of flies are capable of breeding 74, 473, 197, 068, 800, 000, 000, 000 of their kind in a single season. Thanks to the birds and other agencies, flies are kept somewhat in check.

It is almost impossible to keep flies out of the kitchen, milk-room, and cow-stable, but we can greatly lessen their entrance by having the windows and doors screened.

Do not feed the flies, by leaving dirty dishes and pails around.

We must learn to regard them as one of our most deadly enemies.

The fly, with the mosquito, is doomed to extermination on the common ground that both are *dangerous to human life*.

CHAPTER LII

DISEASES COMMON TO COWS — SYMPTOMS AND TREATMENT

IF a cow shows symptoms of being ill, do not delay doing something for her; begin at once to check the trouble.

Every dairy stable should have in it a medicine chest or shelf provided with such drugs as are commonly used in cases of sickness among the animals. A short list is given below. Each bottle or package should be distinctly labelled, and the supply renewed as soon as exhausted.

Spirits of turpentine.	Epsom salts.
Raw linseed oil.	Ground ginger.
Sulphur.	Vaseline.
Saltpetre.	Camphorated oil.
Carbolic acid.	Laudanum.
Nuxvomica.	Boracic acid.

There should be on hand a common bicycle pump, a few feet of rubber hose, and a milk syphon or tube to insert in the teat. Immerse the tube in boiling water to disinfect it, and oil before gently inserting it into the teat opening.

HOW TO EXAMINE A SICK COW

First, take the temperature of the animal by

FARM DAIRYING

placing a self-registering veterinary fever thermometer in the rectum, allowing it to remain there from 3 to 5 minutes. The normal temperature of a cow is from 98° to 100° F.—but in some cows may be higher. It is usually so in young animals.

Second, take the pulse, which can be found at the angle of the lower jaw bone. The normal beat of a cow's pulse is from 50 to 60 per minute.

Third, count the respirations of the animal or number of times it breathes, by watching the sides of the flanks, or by pressing your ear to her side. The normal respiration of a cow is from 15 to 20 per minute.

If the temperature, pulse, or respiration is found to vary much from the normal, you will know the animal is ailing. Dull, glazy eyes; cold ears; dry, hot nose; harsh, staring coat; lack of appetite; rumination ceased; sudden shrinkage of milk, are outward indications that something is wrong with the cow.

Milk from sick cows is unwholesome, and in some cases positively dangerous.

Sick animals should be removed from the herd, and especially if there be any suspicion of a contagious disease.

FARM DAIRYING

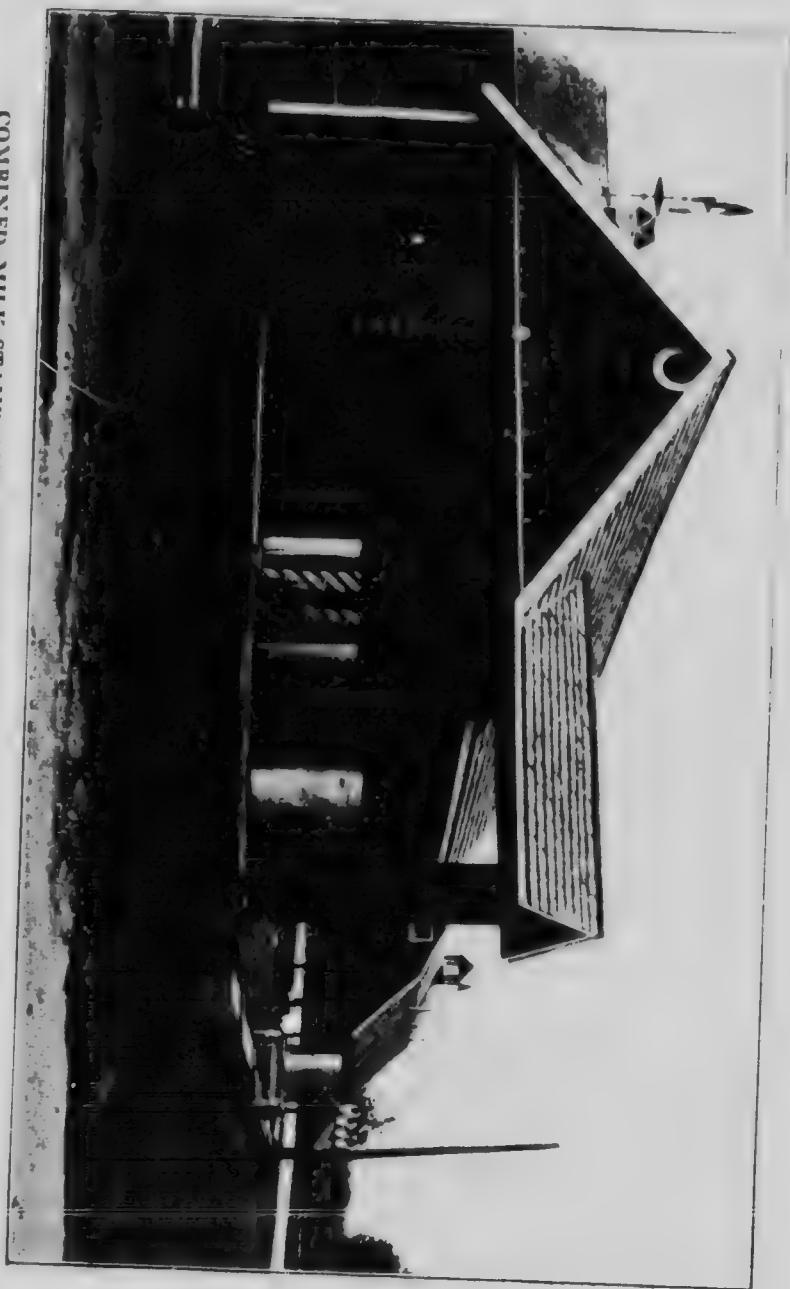
PARTURIENT APOPLEXY — COMMONLY CALLED MILK FEVER

Cause:—Milking the cow out too thoroughly after calving. Better not to draw any milk the first 24 hours, but just leave the calf with the cow. If for any reason it is not desirable to leave the calf with her, draw only a little milk at frequent intervals the first three days, if trouble be feared. If this rule is followed, milk fever is not likely to occur.

Symptoms:—These develop from 4 to 36 hours after calving. Rumination ceases; sudden decrease in milk-flow; dulness of the eyes; unsteady gait; stamping with the hind legs; at length falls helpless to the ground, turns head to one side and eyes close, or lies flat with extremities extended.

Treatment:—It is usually a fatal mistake to dose for milk fever. In many cases, the muscles of the throat are paralyzed and the cow having no power to swallow, the medicine given goes into the lungs and often causes death.

The treatment giving prompt relief in the severest cases, and one to be relied on, is filling the udder with pure oxygen or with common air by means of a bicycle pump, or a rubber bulb syringe, and a common milk syphon or similar tube. Pump



COMBINED MILK-STAND AND ICE-HOUSE WITH TRUCK ON RAILS FROM STABLE

FARM DAIRYING .

the udder as full as possible and put a rubber band around the teats, or tie with tape to keep in the air. Massage the udder so as to force the air to all parts. It may be necessary to repeat the inflation.

This treatment usually effects a cure in a few hours. Do not give any medicine.

MAMMITIS — CAKED UDDER — INFLAMMATION OF UDDER — GARGET

Symptoms: — Usually at first the milk is watery and sometimes discolored with blood, and may contain clotted curdy matter, and the part affected is swollen and painful. In severe cases the cow will have a chill and the limbs, ears, and horns become cold, then fever will follow and the udder becomes hot, swollen, and hard. The milk-flow decreases or stops. The cow eats little and does not chew her cud.

Treatment: — Give oxygen treatment as described for milk fever, and a good dose of salts. If the udder remains hard, rub well with goose grease or camphorated oil. When the entire udder is caked, take a piece of heavy cloth and put it under the udder, making incisions for the teats, and fasten it on top, placing straw or a pad on the back so as not to chafe the cow. This relieves the udder by easing the weight.

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FOR INFLAMED UDDER

Rub well, after milking, with liniment made from 4 ounces sweet oil, 4 ounces laudanum, 3 ounces of extract of belladonna.

BLOODY MILK

Cause: — Rupture of small blood vessels in the udder, sometimes caused by being hurt, sometimes an inherited weakness.

Treatment: — Bathe the udder well and often with cold water and wipe dry. Give the cow one ounce tincture of iron in a pint of water twice a day until cured.

SLIMY OR ROPY MILK (NOT A DISEASE)

Milk which becomes stringy, slimy, or ropy, after standing a while, is not due to the cow's condition, but is caused by a large number of bacteria which develop in the milk and change the milk sugar into a slimy or ropy mass. The bacteria usually come from dust or bad water and get into the milk at milking time or afterwards.

Thoroughly clean and disinfect the stable and scald all milk pails, strainers, cans, etc.

LUMPS IN TEATS

If the lump or tumor be near the point, or half way up the teat, a veterinarian may operate suc-

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cessfully; otherwise it is well to beef the cow, as she will not improve, and her offspring may be similarly affected.

COW POX

Symptoms:—Teats very sore, break out in pimples and form scabby sores. A troublesome contagious disease and the cow should be isolated.

A milker can take it from one cow to another on his hands or clothes.

Remedy:—Dress the sores three times a day with an ointment made by mixing 4 drams boracic acid, 20 drops of carbolic acid, with 2 ounces of vaseline.

If the teats are very sore, it may be well to use a teat syphon to draw the milk.

LEAKY TEATS

Cause:—Teat opening too large, or the muscle weak.

Treatment:—Throw and tie the cow. Insert a milking tube in the teat to preserve the milk duct. With a sharp knife remove the skin from the end of the opening, making a good fresh wound. Draw the edges of the hole together with a few stitches, tying each stitch separately. Dress with a healing ointment.

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This should be done when the cow is dry and is better to be done only by a veterinarian.

If the leak be through a hole on the side of the teat, scarifying the edges of the opening with a sharp pen-knife, when the cow is dry, may cause the edges to unite.

HARD MILKERS — TIGHT MUSCLE AT TEAT OPENING

This can be remedied to some extent by inserting into the teats, and leaving between milkings, plugs made of gutta-percha or hardwood made very smooth, with a bulb on each end to prevent the plug working up or dropping out of the teat.

Some recommend a slight incision through the muscle at the opening. This should be done when the cow is dry and the teat must be plugged during the healing. Some have done it with success when the cow is milking.

TO CURE A SUCKING HEIFER, OR PREVENT SELF- SUCKING

Insert in the heifer's or cow's nose an ordinary bull ring. Just before inserting the ring, slip on it a harness ring the same size, which hangs loosely after the bull ring has been inserted. This is a sure remedy.

FARM DAIRYING

CHOKING

Pass the hand along the neck and try to locate the obstruction. If it can be felt, try to bring it upwards or downward by gentle manipulation. Should this not be possible, the head must be elevated and held out straight and a probang, or piece of rubber hose, put down the throat until the obstruction is felt, when by steady pressure it may be pushed downward. Great care must be taken not to lacerate or rupture the gullet, as this might cause death.

If the cow be much bloated, to prevent suffocation during the operation of forcing the obstruction down, it may be necessary to puncture her paunch, as described in bloating.

IMPACTION OF THE RUMEN OR PAUNCH

Cause:—The paunch becomes overfilled with solid food and its walls so paralyzed as to lose the power of contraction.

Symptoms:—Enlargement of abdomen, the drum-like sound is absent and when the part is pressed the indenture remains for some time. The animal is dull, her breathing heavy; grunts and grinds her teeth.

Treatment:—Give a strong purgative—1½ to 2 pounds of salts and 2 ounces of ground ginger

FARM DAIRYING

in 2 quarts of warm water. Follow up with 2 drams of nuxvomica, every 6 or 8 hours, until the bowels move freely. If the bowels do not move in 18 to 24 hours, give more salts.

A little walking exercise helps the expulsion of the food.

In bad cases, the cow is opened and the food removed by hand. This should be the work of a veterinarian.

TYMPANITIS OR BLOATING

Cause:—Eating fermented grains, rank clover, especially when wet, or with the dew on it, raw juicy potatoes, etc., may cause fermentation and the accumulation of gases.

Symptoms:—The abdomen distended, especially over the left flank; the walls of the belly elastic to the pressure of the hand and when tapped giving a hollow drum-like tone; breathing labored.

Treatment:—If much distressed, prompt relief is afforded by puncturing deep on the left side into the flank 4 or 5 inches from the spine and midway between the last rib and the hip bone. This is best done with a trocar and canula. If one is not at hand, use a knife and insert a large goose quill, or something of the kind, to keep the wound open to allow the gases to escape.

FARM DAIRYING

Give from one to two pounds of Epsom salts and an ounce of powdered ginger.

Further fermentation may be prevented by a tablespoonful of chloride of lime in a pint of water.

In slight cases a dose of 2 ounces of oil of turpentine in a pint of raw linseed oil will generally dissipate the gases.

No food should be given for twelve hours, and feed lightly for a day or two.

IMPACTION OF THE THIRD STOMACH, OR FARDEL-BOUND

Cause:—A diet of coarse, indigestible food and insufficient water to drink. Eating dried grass or leaves, etc.

Symptoms:—Refuses to eat; ceases to chew cud; in some cases slight diarrhœa followed by constipation; head carried low, dull painful expression; stands still, or lies down with head extended; gives a short grunt during expiration; advanced stages, staggering gait, impaired sight, and sometimes symptoms of frenzy.

Treatment:—Same as for Impaction of Rumen. (See p. 287.) Assist the purgation by copious injections of warm, soapy water, three or

FARM DAIRYING

four times a day. If the brain be affected, douche the head with cold water or apply ice.

TUBERCULOSIS

Symptoms:—A dry cough, without other constitutional disturbances, indicates tuberculosis of the lungs. A cow losing flesh gradually and becoming generally unthrifty-looking, may have the disease in any organ. The only safe way to know if the herd be free from this very contagious disease is by having the animals tested with tuberculin.

If any react, they should be put in a stable by themselves, and the building where they have been kept disinfected.

If only slightly affected, the animals may be fattened and sold to the butcher, for the meat is said to be wholesome.

The milk, especially if the udder be suspected of being diseased, should be scalded for the use of either man or beast. There is no known cure. The only way is to test the cows, and keep those free of disease rigidly apart from the others. Drinking from the same trough, eating from the same stall, are easy means of spreading the disease.

If the cow be a valuable one, and the disease is

FARM DAIRYING

not deeply seated, she may be kept for breeding purposes, but the calf must not be allowed to suck any of its mother's milk. If the cow's milk be thoroughly pasteurized, it is then safe to feed.

RHEUMATISM

Cause:—Exposure to cold and wet, especially when heated by driving. Lying on cold floors, or standing in a draught.

Symptoms:—If acute rheumatism sets in, there will be loss of appetite, roughness of coat and dryness of muzzle, bowels constipated, urine high colored, joints swollen. The symptoms of chronic rheumatism are similar but less severe.

Treatment:—Give 2 pounds of Epsom salts and one ounce of ground ginger. Follow up with 2-dram doses of salicylic acid three times a day.

Rub the joints well three times daily with camphorated liniment.

Keep the animal warm and dry.

WOUNDS OR CUTS — LACERATED UDDER

First stop the bleeding by tying a bandage of clean muslin directly over the wound or above it. Often a bleeding artery will protrude. A thread can be run under it with a needle and the artery tied. After the bleeding stops, cut off the ragged edges of muscle with scissors which have been

FARM DAIRYING

dipped in an antiseptic solution. Then bathe the wound with an antiseptic wash made from corrosive sublimate tablets, formalin, boracic acid, or creolin. Let nature do the healing. Keep the wound clean and free from germs by frequently bathing it with the antiseptic wash.

Sometimes a cow's udder is badly torn on barbed wire or brush. Thoroughly cleanse the wound with an antiseptic wash, using a syringe if one is at hand. Trim the rough edges and draw the cuts together with white silk thread, tying each stitch separately. Leave an opening of an inch at the lowest point of the wound. Insert in this opening a small piece of cotton wadding to help carry away any discharge. Bathe the wound if necessary with a boracic, or weak carbolic acid wash and renew the wadding. When healed remove the stitches.

WARTS ON UDDER

Tie the warts tightly with silk thread or horse hair. In about three days the warts will drop off. If the warts have a slender attachment they may be clipped off with scissors. To prevent the warts growing again, touch the spots with caustic. Some people burn the warts off with caustic.

FARM DAIRYING

COWS CHEWING BONES

The cows need food rich in nitrogenous and mineral matter, such as wheat, bran, chopped oats, clover or alfalfa hay. Have salt always before them, and once or twice a week put a small handful of hardwood ashes or bone ash mixed with salt, in their meal. The cows evidently crave more mineral matter and this supplies it to them. The trouble is usually due to the absence of phosphate in the soil.

RING WORM

A vegetable parasite easily communicated. Burn all litter, clean and whitewash stalls, etc. Wash the affected parts of the animal with warm water and soap. Cut the hair around the sores. Paint with tincture of iodine for several days and rub on zinc ointment if sore.

CONTAGIOUS ABORTION

Abortion being a contagious disease, the germs will lurk about the stables and infested animals for years.

Use some good disinfectant freely around the stalls, gutters, etc. Give each animal that has aborted, 40 drops of pure carbolic acid in one pint of water in its food three times a day, until all vaginal discharge ceases.

FARM DAIRYING

As a preventive, give the other cows the same dose twice a day for the same length of time.

Some dairymen dose their cows in this way with carbolic acid every two or three months, just in case this dreaded disease might break out.

Another simpler method, which can be used when cows are in pasture, is to mix thoroughly 100 pounds of barrel salt pounded fine, and one pound of crude undiluted carbolic acid, or 4 ounces of the acid to 12 quarts of salt. Give to the bulls and cows as one would ordinary salt.

RETENTION OF THE AFTER BIRTH

In case the after birth does not come away, give a few doses of carbolic acid (40 drops) and no other assistance will be necessary.

DIARRHŒA OR SCOURS IN CALVES

Cause: — Over-feeding; sudden changes in feed; filthy, wet stalls; dirty feed pails, etc.

Treatment: — A cup of strong black tea is said to be good. Others give from one to two ounces of castor oil and one teaspoonful of laudanum. Feed new milk and keep everything clean. Four or five hours after the oil is given, a teaspoonful of a mixture of one part salol and two parts sub-nitrate of bismuth may be given in half a pint of milk, or the powder placed on the tongue and

FARM DAIRYING

washed down with a little milk. A simple remedy is to add to the milk one-fifth of its bulk of lime water.

WHITE SCOURS

A contagious disease resembling navel ill in foals. Tie the navel cord, two inches below the navel, and wash the navel with a 15 per cent solution of formalin or a 5 per cent solution of carbolic acid. If this is done promptly after the birth of the calf, it will in most cases prevent the disease.

If it does develop, take 15½ ounces of water and add ½ ounce of formalin. Add a tablespoonful of this solution to a pint of warm milk and give in a bottle to the calf three or four times a day.

UNTHRIFTY CALVES — INDIGESTION

Symptoms:—Grind their teeth. chew sticks, lose flesh.

Treatment:—Make the following up into 50 powders: 2 ounces each of gentian, ginger, nuxvomica, and bicarbonate of soda.

First give each calf 4 ounces of raw linseed oil. Afterwards a powder in a pint of new milk three times a day. Put a little lime water in the milk they get.

FARM DAIRYING

UNTHRIFTY HEIFERS

First give dose of salts ($\frac{3}{4}$ pound). Take equal parts of sulphate of iron, gentian, ginger, nuxvomica, and carbonate of soda. Mix and give a heaping tablespoonful three times daily in one pint of cold water.

FOR LICE ON CATTLE

Mix one part of hellebore or insect powder with three parts of cement, and dust along the backs of the cattle. This makes a good insecticide. Slaked lime sprinkled on the cattle is also good.

RED WATER

Cause:—Pasturing on low swampy land, and another form, called parturient red water, may appear about the time of calving.

Symptoms:—Urine reddish color, and a general unthriftiness.

Treatment:—Feed well and give one ounce tincture of iron and 4 drams chlorate of potash in a pint of cold water as a drench three times daily as long as necessary.

BURYING DISEASED ANIMALS

When burying an animal which has died of any contagious disease, put half a barrel of fresh lime over it.

Crystals of copper sulphate may be used.

FARM DAIRYING

Burn all bedding, litter, etc., and whitewash the walls, stalls, etc., having some disinfectant in the wash.

SPLENDID LINIMENT FOR BOTH MAN AND BEAST FOR SPRAINS, BRUISES, RHEUMATISM, ETC.

1 pint of strong vinegar.

$\frac{1}{2}$ pint of turpentine.

1 ounce gum camphor.

2 eggs.

Soak the eggs in the vinegar until the shells are quite soft. Rub the lime from the shells in the vinegar. Break the eggs into the vinegar, removing the tough lining. Add the turpentine and the shaved camphor. Pour into a bottle and shake until of a creamy thick consistency. It is then ready for use and will keep indefinitely.

STOCK FOODS — TONICS

Much money is yearly spent in "stock foods." When the cattle are well there is no more need of stock food than for a healthy person to take medicine. If the cattle are not thrifty and need toning up, to buy the ingredients and mix your own medicine is better and vastly cheaper.

FARM DAIRYING

No. 1

- 1 lb. ground gentian.
- $\frac{1}{4}$ lb. ground ginger.
- $\frac{1}{4}$ lb. powdered saltpetre.
- $\frac{1}{4}$ lb. powdered iron sulphate.

Mix and give one tablespoonful in feed once daily for ten days, omit for three days and feed as above for ten days more. Cost, about twenty cents per pound.

No. 2

- 2 lbs. Fenugreek.
- 2 lbs. ground ginger.
- 2 lbs. powdered gentian.
- 2 lbs. powdered sulphur.
- 2 lbs. potassium nitrate.
- 2 lbs. resin.
- 1 lb. cayenne pepper.
- 11 lbs. flaxseed meal.
- 5 lbs. powdered charcoal.
- 5 lbs. common salt.
- 25 lbs. wheat bran.

Cost, about \$4.50 per 100 pounds. Mix well and feed the same as No. 1. This tonic is almost identical with the commercial mixtures.

THE END

Three books which
should be in the
library of every pro-
gressive farmer.

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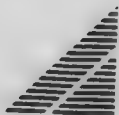
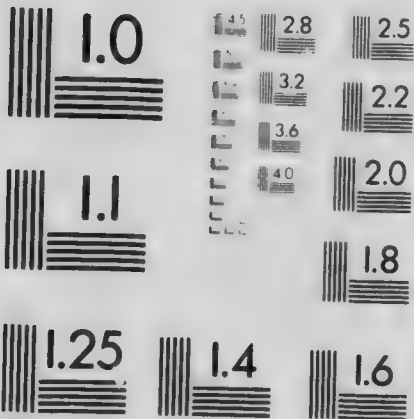
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